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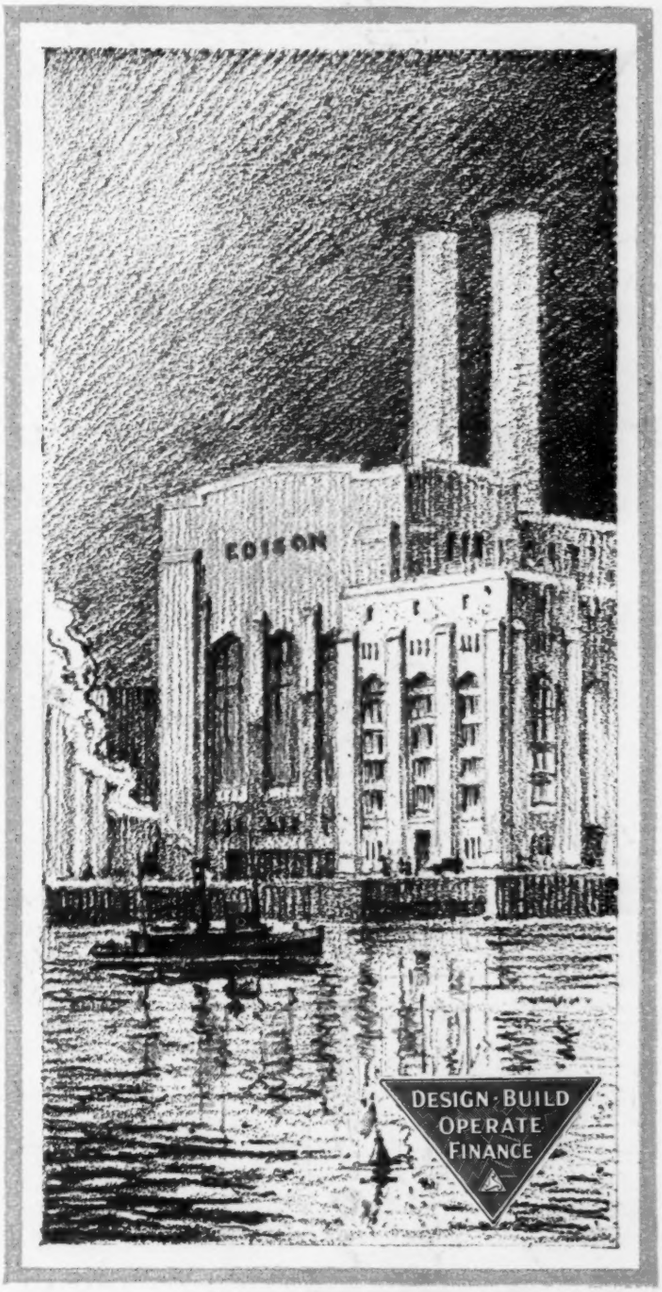

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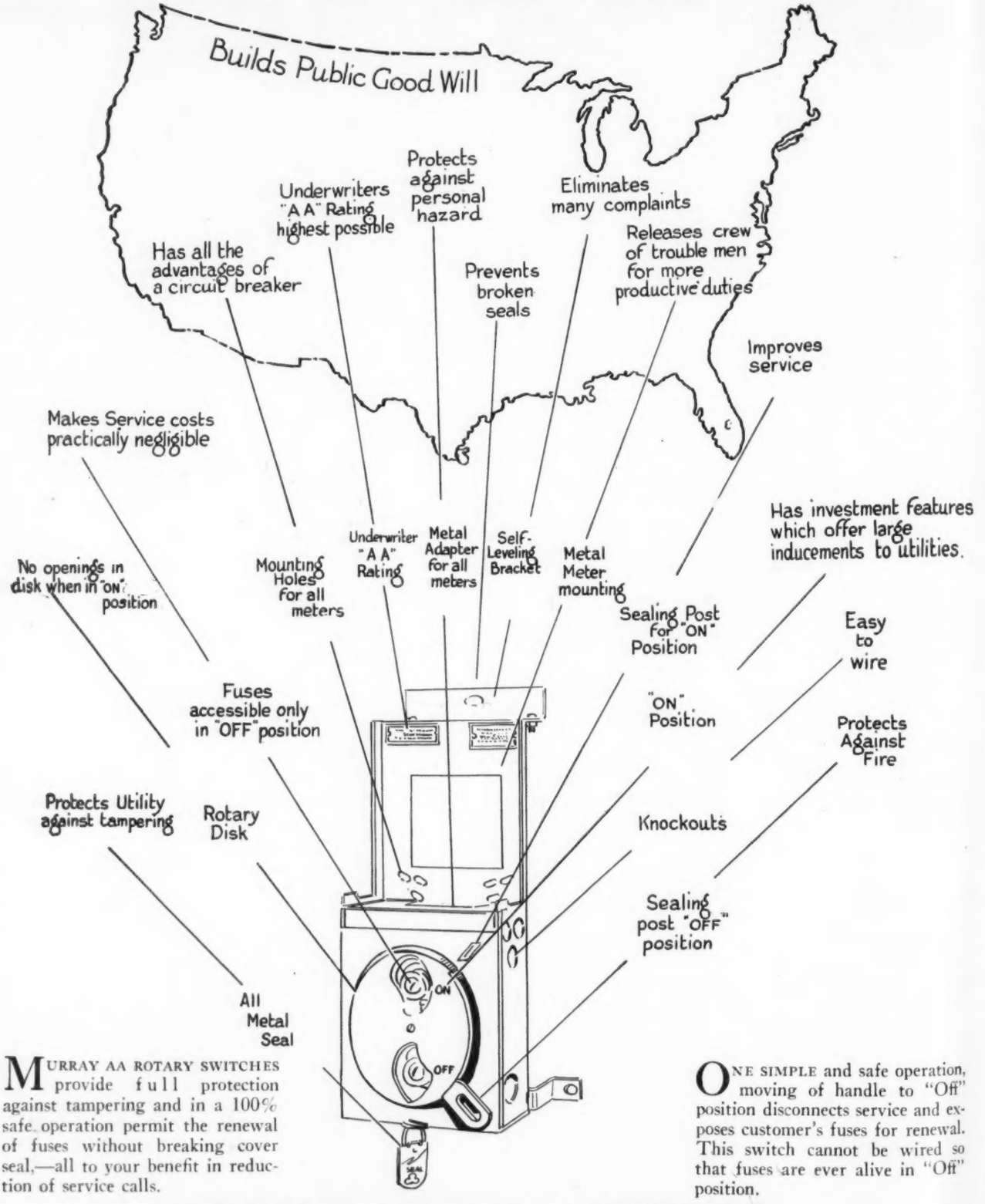
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Electrical World

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W. H. ONKEN, JR.
Editor

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Power and Labor

AT THE convention of the American Federation of Labor in Atlantic City this week a new departure in labor wage philosophy was announced. A resolution was proposed to the effect that wages be increased and days be shortened in the degree that the development of labor-saving machines and water power tend to increase industrial production. It was argued that industrial progress must not become punitive in its effect upon the worker and that social inequality, industrial instability and injustice must increase unless the wages and purchasing power of workers be advanced in proportion to man's increasing power of production. It was also contended that leisure should be introduced as a factor to equalize changing conditions.

Labor is in error in its conception that water-power development is having any great effect on industrial progress, but is correct in its assumption that the great use of power and labor-saving machinery in this country is having an appreciable effect on social and industrial conditions. Even a casual survey shows that the prosperous condition of the worker in America is due to these beneficial elements in industry. Because this country uses power and machinery labor is better paid than in any other country. Surely the leaders of American labor will recognize that increased production is the best means of enhancing the status of labor in the United States and will not advocate the adoption of a "ca'-canny" policy such as has resulted in disaster to England and English labor.

Economic laws need no artificial aids to continue to keep American labor prosperous and contented, and labor should be the first to recognize the elements that have made possible its present status.

Duke's Death a Great Loss to the South

A CAPTAIN of industry who contributed greatly to the upbuilding of the South and who, although not widely known in electric light and power circles, was one of the greatest exponents of hydro-electric development in the world was removed by death last week. J. B. Duke was essentially a Southerner. He loved the Carolinas, their traditions, customs and people. To make the Tar Heel and Palmetto states the New England of the South was his ambition. He therefore became identified with the cotton-mill industry and more particularly with water-power development, so that Southern spindles might have the advantage of electric power. True, tobacco gave him prominence and great fortune; but the development of the natural resources of North and South Carolina and the dedication to education of forty millions or more of money earned from water power linked the name of Duke with the other Southern immortals. The Southern Power Company was, by and large, J. B. Duke's personal property, and when last December he established Duke University he virtually made it the trustee of that power company.

Although to W. S. Lee and C. I. Burkholder fell the work of building and operating the property, it was the mind of Duke that directed the enterprise and caused the Southern Power Company to become the dominant producer of electricity in the South at a time when interconnection and mass production were still economic theories. And the marvelous feature of the enterprise was that it was achieved single-handed, for Duke usually worked alone. He was not a mixer or given overmuch to co-operation, but he believed in the injunction "whatsoever thy hand findeth to do, do with all thy might," and he applied himself diligently to every task. Steam he regarded with tolerance rather than enthusiasm, for he had great faith in water power —greater in fact than most men, as his latest venture on the Saguenay River in Quebec proves.

Fortunately last December Mr. Duke set in motion plans for carrying on his various projects so that his death will not affect them. His loss, however, will be felt, especially in North Carolina, because he was one of those to whom men refer as "giants of industry."

Federal Regulation and Interstate Power

LIKE most of his utterances affecting the electric light and power industry, Herbert Hoover's speech to the public service commissioners assembled in Washington this week was constructive and timely. Owing to the evolution in the art of electric power production and transmission, the lines of some power companies now cross state borders, and questions of interstate commerce and federal regulation are beginning to puzzle the state commissions. Public utility companies, too, knowing the experience of the steam railroads with the Interstate Commerce Commission, are decidedly of the opinion that it is better for them to endure the evils they have than fly to others they know not of. Into the controversy thus created Hoover flings himself and, speaking as a citizen rather than as a federalist, he says: "I believe there is no surer method of sapping the freedom of self-government and the sense of responsibility of our citizens than unnecessary extension of federal control over economic services which so vitally touch the life of every family, every industry and every community." To all of which most men will say "amen."

The Secretary of Commerce is of the opinion that the individual states have full control over interstate power and that it needs no new machinery, no complicated interstate compacts or federal authority to cope with the situation. The states, he says, are powerful enough to rule in their own house without "wishing" their responsibilities on a centralized bureaucracy or allowing a centralized bureaucracy to dictate to them. Thus he indicates a line of action for the state commissions to follow. The problem is theirs, however, and

not his, and, with the exception of a few instances, if the federal government regulates the electric light and power industry even in part, it will be because the state commissions have permitted their case to go by default. State regulation, as the commissioners well know, needs strengthening in many places to make it less vulnerable to local attack. To this task the commissioners should apply themselves without much delay, for, thus fortified, federal regulation, if it is attempted at all, can be more effectively warded off. The ghost of federal control, however, will not down unless the state commissions exercise the authority which Secretary Hoover confidently asserts they possess.

Watch the Application Counter

PROBABLY no point of contact which the utility has with its customers is so fraught with possibilities both of gaining the friendship and of arousing the lasting ill will of customers as the service application counter. Taking orders for service or for discontinuance at one address and renewal at another is a real "job" and calls for a large measure of tact, diplomacy and discretion on the part of the individual behind the counter. It is a position of responsibility which no company can afford to trust to any clerk or employee who happens to be available. Yet too many specific instances could be cited of companies which have filled these important points of contact with youthful employees whose impatient words and actions suggest that their chief interest is not in their work and that they regard the actual taking of customers' service applications as a necessary but most disagreeable duty.

Earnest efforts to build good will, improve public relations and make the utility business understood by the public can be wrecked in the mind of the customer if he receives short shrift at the hands of an indifferent or ill-tempered application clerk. Executives cannot keep too close an eye upon the application counter, and an occasional first-hand inspection of the way customers are being handled may serve to prevent too many boys being put at a man's task.

Transmutation of Metals

IT IS not so many years ago that the scientific world was thrown into excitement by the announcement from Sir William Ramsay's laboratory that he had succeeded in transmuting copper into lithium. Notwithstanding the fact that the alchemists of the Middle Ages had dreamed of the transmutation of the baser into the more precious metals, up to recent years modern science had regarded this possibility as only the dream of the visionary. The discovery of the electron and its universal prevalence in all matter revived the dream of transmutation, but the scientific world was scarcely ready for the announcement from Ramsay's laboratory and was not surprised when the first announcement was subsequently recalled as being premature. However, within a brief span of years discovery has advanced, and announcements of the transmutation of one metal into another now make little if any ripple in the steady stream of physical progress.

A number of experimenters have apparently succeeded in their attempts at transmutation. Professor Miethe claims to have obtained gold by passing a strong electric current through mercury vapor. From Amsterdam comes the statement of the decomposition of lead—a more difficult matter since lead vaporizes at much higher temperature and involves much greater care in the construction of the necessary quartz lamp. In these experiments the lead is apparently transmuted into mercury. Professor Nagaoki of Tokyo has reported obtaining gold as well as another metal, which he thinks is platinum, from mercury.

These announcements have great interest and scientific importance. It is to be remembeerd, however, that they do not by any means suggest commercial and economical methods for effecting transmutation. In fact, it is only by using the most extreme values of electric force and temperature that even a few atoms or molecules are transformed. In most of the cases the only indication of transmutation is the appearance in the spectrum of the lines pertaining to the element which is being manufactured. As a consequence of this nearly all the experimenters are on the defensive against critics who assert that the manifestations are due to impurities in the original metal. Particular interest therefore attaches to Professor Miethe's latest announcement, in which he claims to have obtained gold from very carefully purified mercury, and in such magnitude that it can be determined by standard chemical tests.

Distribution Problems Are Discussed at Seattle Convention

DISTRIBUTION men had their innings at the A. I. E. E. convention held recently in Seattle, when eight papers devoted to distribution practice were presented. These papers dealt principally with the problems of designing distribution systems to keep pace with the rapidly increasing load densities in the larger cities and showed clearly the necessity of planning systems far in advance. It was evident that one of the most important questions confronting distribution engineers was just how far in advance to plan and what load densities to assume.

Various systems of overhead and underground distribution have been proposed and are being used, but the engineers agree only on the one point—that higher voltages must be used. The older 2,300-volt delta system for overhead lines has been superseded in many cities by the 4,000-volt, four-wire, three-phase, Y-connected system. But even this voltage is considered too low by some engineers, and one installation was described at the meetings where a 4,400-volt, three-phase delta system is being used which it is later proposed to reconnect for four-wire Y operation. The discussion, however, indicated that there was a majority opinion in favor of 4,000-volt, four-wire primaries and the later division of areas to be served into smaller units and feeding these from automatic alternating-current substations supplied from a ring-feeder system of 11,000 volts or higher. Many of these substations would of necessity have to be erected in residential districts, and several companies on the Pacific Coast have installed substations of special design to harmonize architecturally with the homes in the neighborhood. In this way protests from the residents of the district have been obviated.

Even the present generation may see the day when

load densities will reach one kilowatt per capita, and it is encouraging to find that distribution engineers are studying how to meet this situation most economically.

"The Instruction of the Consumer"

MISS KATHERINE A. FISHER, who is director of Good Housekeeping Institute, spoke the other day to the league men at Association Island on the topic "What Women Want to Know About Electricity in Their Homes." She made two very significant statements. Out of something like forty thousand letters that have been written by the housekeepers of America to the institute on the full range of domestic problems, she said that more than 20 per cent of the questions were related to electrical appliances. That gives a picture of the interest of the modern housewife in the labor saving and comfort of electric service. "But," she said, "the housekeeper is an amateur in the use of these things. Moreover, she is not a mechanical specialist. She must know so much about so many things that she cannot be expected to specialize in anything, and before she will begin to use any device she must be interested and instructed."

The instruction of the consumer should be the keynote of the electrical industry's publicity to the American home, according to Miss Fisher. The idea of these new processes must be made clear. This is more important than technical talk about competitive equipments. Moreover, extravagant claims should be avoided, she says, because they inevitably bring disappointment, and before an appliance is sold the customer should be frankly advised as to the need for servicing that may be expected. This is certainly good advice which both the manufacturers and the retailers of electrical household devices can well afford to ponder.

Economical Interconnections Between Utility and Industrial Plants

THE large steel plants of the country have an important place in the development of the most economical power supply for the nation. Their power requirements are great, and both their methods of power production and their demands for power are such that interconnection with the plants of utility companies often makes for marked economies. Gas and tar as by-products of their manufacturing activities can be used for fuel in their boiler plants, and their plant capacity can be utilized more economically if tied in with a large utility system. Moreover, the ability of the utility system to act as a source of reserve power and peak power to the steel mills minimizes the investment in plant capacity.

In eastern Pennsylvania and in Alabama large steel mills have been interconnected with utilities for several years and the resulting operations have been found very satisfactory. In the Pittsburgh and Chicago districts moves are being made to obtain the same results, and very extensive developments in this type of interconnection are promised in the near future.

In some contractual and technical features these interconnections are unusual. Steel mills must have very reliable power, for theirs is a business of production, and yet the load in the mills is subject to wide fluctuations and presents a difficult item to predetermine for purposes of power interchange negotiations. The steel mills must be protected from troubles arising in the utility system, and the utility system in turn must be protected against troubles arising inside the steel plants. Power measurements, the control of kilowatt and kilovolt-ampere load divisions at different times and localities and the working out of equitable costs and charges must all be studied very carefully. Fortunately, experience is now available, and the success of the pioneer attempts augurs well for further progress at a time when full advantage of interconnection possibilities may be had.

Aggressive Lighting Departments Are Amply Justified

CENTRAL-STATION companies in general have been slow in establishing lighting departments. It is true that some of the leading ones have been active in this direction for many years and with good results. However, in most cases, aggressiveness has not been comparable with revenue possibilities. Some of the largest and otherwise most ably managed companies have just established lighting departments, and many have no lighting specialists on the payroll. Of course, electrical development is bound to progress merely from consumer demand without encouragement from the central station. Superficially this is fortunate, but it is really a mixed blessing. This natural growth has made it possible for electric light and power companies to prosper, to some extent at least, even in the absence of vigorous sales policies. A most natural result of this steady development due to outside demand is a drying up of aggressiveness from within.

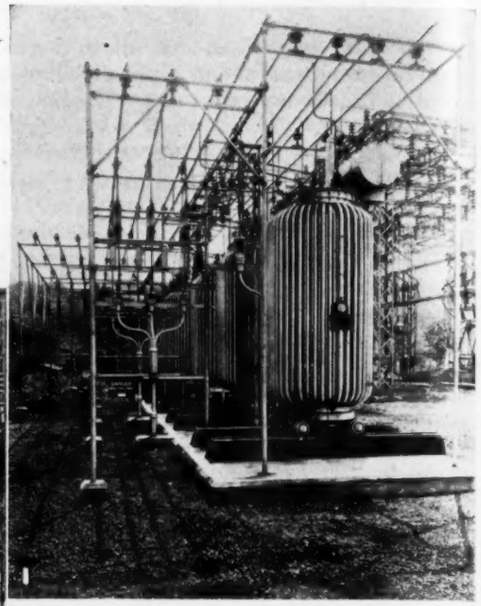
The central-station company is in the business of selling service, and sales pressure is desirable and justifiable up to the point where the consumer is properly "electrified." This is not only good business for the company and its stockholders, but it is a duty to consumers—actual and potential. For the consumer there is only the present to enjoy and to profit by. The blessings of electricity should come to him now.

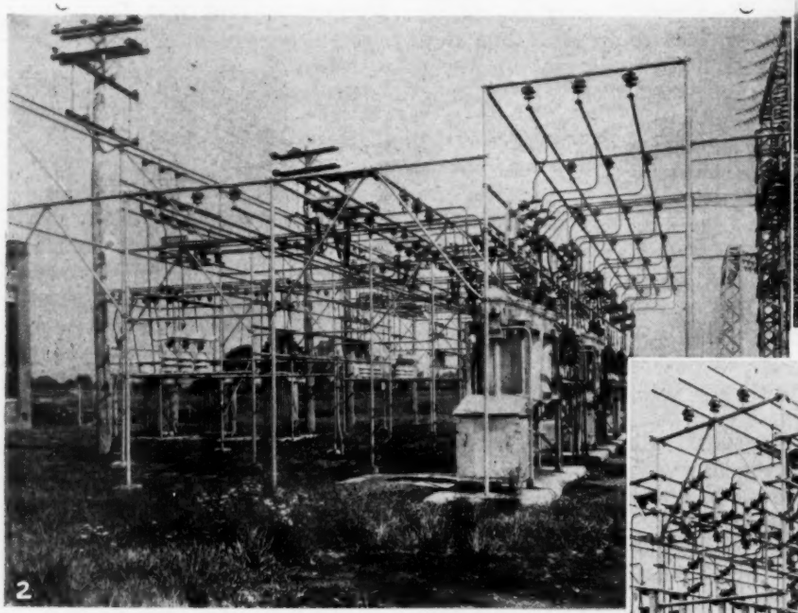
Certainly, artificial lighting is notoriously inadequate and improper in most places. A great field is awaiting the lighting department on every hand. The light and power company receives most of the profit from artificial lighting, and therefore it should do its share. The scarcity and inadequacy of lighting departments testify that it is not doing it. Is it possible that the natural growth in the electrical business has blinded many executives to the desirability of aggressive policies in this direction, so that other phases are taking an inordinate share of their attention at the expense of revenue?

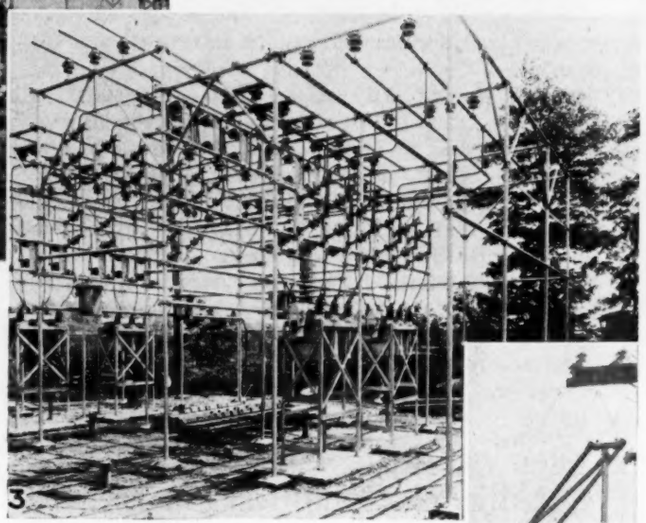
Wherever lighting departments have been established and manned by capable, unfettered men they have worked wonders. These successes have not been confined to large companies. There are cases where lighting departments of relatively small companies have grown remarkably because they have made net revenue grow even faster. Artificial lighting has a great present as well as a great future. On every hand existing installations need increased wattage and modern equipment. A study of the influence of such augmentation or rehabilitation upon net revenue surely will convince executives that neglect of this phase of their business is a costly mistake.

Bus Structures of Pipe Framing Combine Operating Flexibility and Mechanical Stability

BUS structures built of pipe framing are extensively used by the Connecticut Light & Power Company. Among the advantages of this type of construction are speed of erection, great flexibility in adaptation to system changes which modify substation connections to feeders and transmission lines, satisfactory mechanical strength and convenience in standardization. Space is also conserved by the use of pipe framing and readjustments of clearances, changes in insulator locations, etc., are easily made.





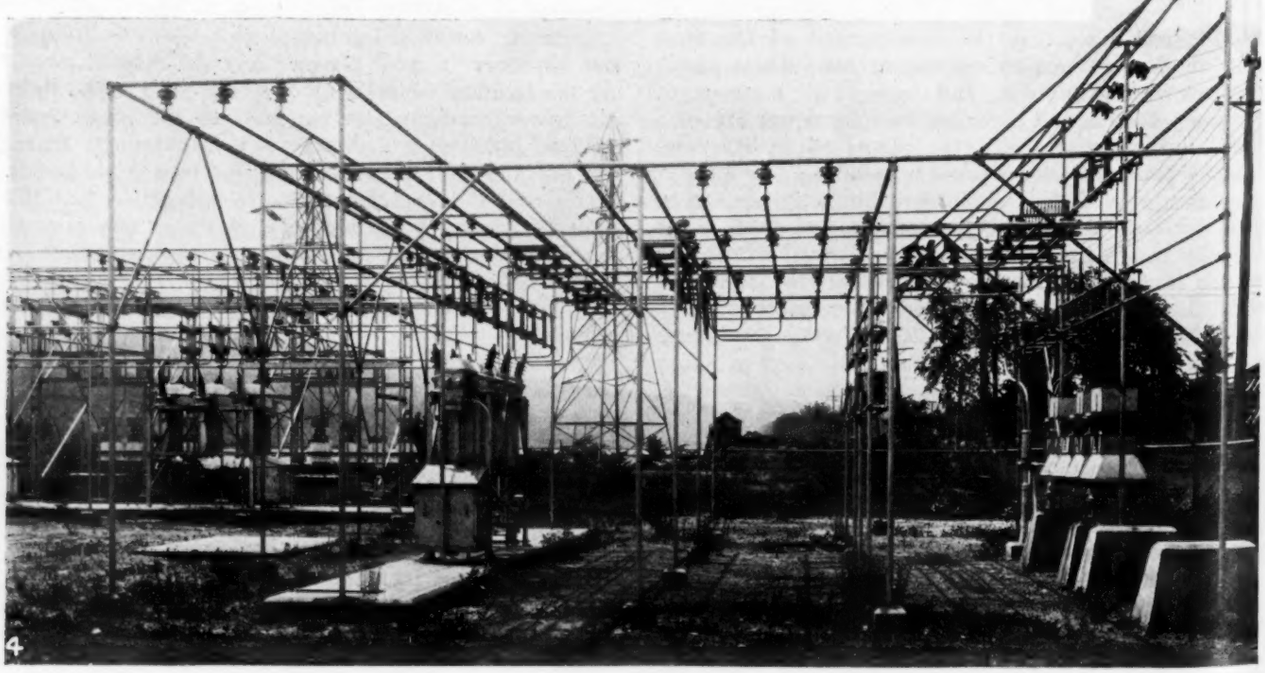


1. Pipe structure for 13.2 and 6.6-kv. buses at Derby, potheads and cables connecting with local station.

2. Side view of 13.2-kv. bus structure at Southington. Main bus at right, slightly elevated; transfer bus at left. Lines are taken out to pole line; lightning arresters and other heavy equipment are mounted on pipe framing. Bus is fed overhead from a transformer bank stepping down from 66 kv.

3. Section of 13.2-volt bus structure under construction at Seymour. Space limitations necessitated the erection of the main bus in U-shape, as shown, on underslung supports. The transfer bus is in the center on upright insulators. Feeders are to be taken off through underground cables.

4. Side view of 13.2-kv. bus structure at Derby. Main bus at left, slightly elevated; transfer bus in middle. Outgoing line dead-ended on pipe frame at extreme right.



How to Sell Illumination

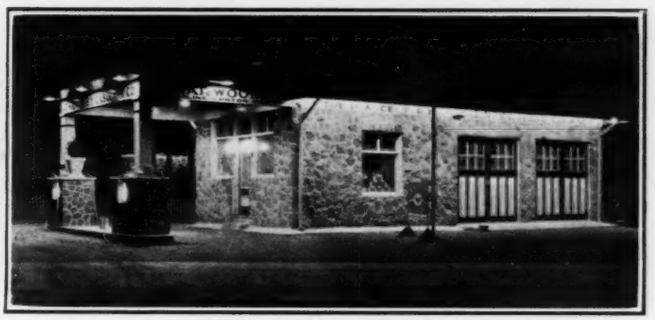
How a Central-Station Company's Lighting Sales Are Increased by Intelligent Engineering Service to Contractors, Architects and Customers—Results of One Year's Work

By C. R. TRACY
Illuminating Engineer Pennsylvania-Ohio Power & Light Company

BY RECOMMENDING and supervising the installation of improved lighting equipment for its commercial customers the illumination department of the Pennsylvania-Ohio Power & Light Company has during the last year effected substantial additions to the company's lighting load and revenue and at the same time afforded these customers a valuable engineering service that has been appreciated.

The company's illumination department now consists of four men, all experienced in modern illumination design. The territory served by the company covers about 600 square miles in eastern Ohio and western Pennsylvania, and excepting the operating company in New Castle, Pa., which employs an illuminating engineer to take care of that immediate vicinity, all of this work is taken care of from the main office in Youngstown.

WELL-LIGHTED OUTDOOR SWIMMING POOL



CONCEALED LIGHTING OF GASOLINE-FILLING STATION

GAINING CONFIDENCE OF ARCHITECTS AND CONTRACTORS

When the department was first organized, architects and contractors were advised that the services of experienced illuminating engineers were available without cost to them in working out lighting problems. At first they were slow to take advantage of this service, but recently the company has been receiving hearty co-operation from the local architects, so that we feel that we are fast overcoming one of our biggest problems. We are also receiving what we consider good co-operation from electrical contractors.

One of the obstacles to the improvement of commercial lighting with which an illuminating engineer has to contend after first selling the customer is next to sell the electrical contractor on the installation according to specifications. It sometimes happens that the contractor is overanxious to get a particular job, and he suggests dispensing with one or two outlets, possibly stating that the illumination department means well but that by eliminating the one or two outlets the job will be just as satisfactory. Nine times out of ten this practice results in a dissatisfied customer for the contractor; also a dissatisfied customer from the central-station company's viewpoint. There is no question that closer co-operation among the illuminating engineer and the architect, the electrical contractor, and even the manufacturer of lighting equipment is absolutely necessary to insure satisfied customers to all concerned.

Illuminating engineering, in a practical sense, is largely education of the customer to the values of better lighting, and with this in view the Pennsylvania-Ohio company arranged to take groups of business men and city officials to Nela Park at Cleveland for the purpose of showing them the proper use of lighting through practical demonstration.

The first group consisted of two business men's associations and the City Council, which was primarily interested in street lighting. However, the program was not confined to this subject and this trip alone resulted in numerous inquiries for better lighting. One of the business men in particular asked for a survey of his garage, offices and show rooms, and as soon as it was completed prices were obtained from a competent electrical contractor, the job was let, and the installation was made in less than a month after the trip.

Another group taken consisted of the local architects, for whom a program of especial interest was arranged. The effect of this trip is reflected in the fact that we have found the architects are now more than willing to consult and work with us in laying out the illumination for both residential and commercial buildings. In fact, one architect submitted the plans for his own residence to us for the lighting layout.

In order to stimulate interest in store lighting, we arranged to take a representative group of merchants to Nela Park, and again the interest and enthusiasm shown have resulted in numerous requests for information pertaining to their particular stores.

Since the organization of the company's illumination department it has at no time been necessary to resort to solicitation. In fact, we usually have a waiting list of from five to twelve customers who have asked that their lighting equipment be investigated and that

AN INTERESTING APPLICATION OF LIGHT FOR ADVERTISING PURPOSES

changes be suggested. These requests are handled in the order in which they are received and a careful check is kept on the progress made with each customer.

HANDLING ILLUMINATION SURVEYS

The first step after a request is received is to place the customer's name, address, telephone number and other information pertaining to the particular type of installation required on a small index card, which is placed on the waiting list. At the first opportunity, this card is given to one of the members of the department and if blueprints of the store or building are not available, arrangements are made to measure the floor plan and take other necessary data. Sketches are then drawn, of which it is customary to make four copies, showing the exact location of outlets, the mounting height of units and the recommended type of lighting equipment. During this procedure the customer's index card is placed under the heading "Working on Layout."

After completing the sketches necessary, a detailed report is typed and this, together with the sketches and descriptive pamphlets, is inclosed in a cover sheet, two copies being sent to the customer, the other copies being retained for future reference in our files. At this point the customer's index card is placed under the heading "Recommendations Made."

Later on it is checked up, and if we find that the installation is under progress, the index card is placed under the heading "Installations Under Construction." The work is followed through very closely by the man who originally made the layout, and as soon as the installation is completed the index card is transferred to the new heading, "Installation Complete."

A weekly report covering the activities of the department is sent to the commercial manager and the various headings referred to are used in this report, so that at a glance he can tell just what the department is doing. Under the heading "Installations Complete" in the weekly reports the name of the customer, the location, the increased kilowatts connected, the estimated annual revenue and the approximate intensity in foot-candles are used, as additional data. At the end of each month the combined weekly reports are made up in the form of a monthly report, showing the activities during that period.

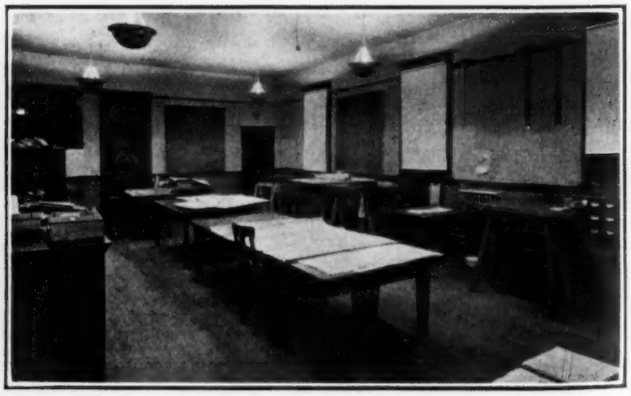
ADDED LOAD AND REVENUE

A brief review of the illumination department's work for the last year shows what it has accomplished in the addition of new load resulting in increased revenue for the company. Customers have been itemized under twelve classes according to the kind of business, and these have also been segregated as existing installations where changes were made and entirely new customers. Summarizing, there was a total of eighty-seven installations completed, resulting in an increased connected load of 460.92 kw., representing a total annual increased revenue of $26,560.72.

RESULTS OF RECOMMENDED IMPROVEMENTS IN LIGHTING

Class of Customer	Old Installations: No.	Old Installations: Increased Kw. Connected	Old Installations: Increased Annual Revenue	New Installations: No.	New Installations: Kw. Connected	New Installations: Annual Revenue
Stores	17	46.7	$3,354.75	16	83.8	$6,931.11
Offices	10	16.7	958.65	4	82.4	5,041.60
Industrial	..	....	.....	5	50.9	4,253.40
Schools	..	....	.....	4	31.4	387.00
Parks	3	39.3	112.50	3	35	452.00
Miscellaneous	6	20.5	551.90	3	12.3	1,558.70
Churches	3	.5	24.48	1	2	41.00
Libraries	2	2.7	270.00	..	....	.....
Garages	2	1.92	11.40	1	15	648.00
Gas stations	..	....	.....	3	11	751.25
Residences	..	....	.....	1	5	20.00
Street lighting	2	2.2	193.00	1	6.1	1,000.00
Totals	45	130.52	$5,476.66	42	330.4	$21,284.06

In addition we made recommendations for thirty-two installations of lighting equipment which are under construction. These included six stores, six miscellaneous, two garages, one residence, ten schools, one office building, two churches, two gas stations and two street-lighting contracts. Recommendations were also



AT LEFT—INDIRECT LIGHTING OF PUBLIC LIBRARY. AT RIGHT—INDIRECT ILLUMINATION OF PENNSYLVANIA-OHIO COMPANY'S DRAFTING ROOM

made for eighty-three other installations, on which work has not yet been started.

The activities of this department are not confined to revenue-building jobs. For instance, the Ford motor truck shown here, which was used to sell ice cream in the residential districts at night, was successfully illuminated by the use of bus-lighting equipment. Other views show examples of window lighting, totally indirect lighting and the application of concealed indirect lighting for a library.

CENTRAL STATION SETS EXAMPLE

One feature in connection with the department's activities has been to sell our own company the idea of proper illumination. A drafting room reproduced herewith shows an application of totally indirect lighting. In carrying out the company's lighting program, we have endeavored to install such types of lighting equipment as could be used for practical demonstration to customers. On two of the buildings that are flood lighted five different manufacturers' equipment has been installed, thereby making it possible to show customers just what might be expected of any particular type of flood-lighting projectors. This same policy is being carried out throughout the general offices of the company.

At the present time the company's activities are directed toward residential, commercial, industrial, street, highway and boulevard lighting. We have under construction, for two real estate allotments, ornamental white way standards and are actively engaged in the promotion of about five miles of highway lighting; also ornamental street lighting for two of the smaller towns in our territory.

Profit on Refrigerator Sales

Need of Pioneering and Servicing Requirements Force Central Station to Lead—Sound Business Principles Demand Profit

BY S. D. HEED
Vice-President Union Gas & Electric Company, Cincinnati, Ohio

IF DOMESTIC refrigeration is to become universally popular, the actual merchandise sale is of far less consequence than the service that will be necessary after the machine is installed. Any recognized branch of the electrical industry or any established merchandising firm could handle the original sale, if the proposition offers adequate reward for the necessary effort, but who will do the servicing?

The electric refrigerator has reached the stage of development where it is entirely possible to sell the machines, but the prospect is going to give great consideration to the question of service. Anything less than adequate service will tend to destroy public confidence, cause dissatisfaction, impair good-will, and naturally be very undesirable from the standpoint of the central station.

MUCH PROMOTION NEEDED

The question has been raised, Should central stations merchandise electric refrigeration? In my opinion, the answer is Yes, and at a profit. But this does not mean that others cannot do likewise. Paternalism is not the proper basis for sound business development.

While the domestic refrigerator may be considered as being beyond the experimental stage, it still requires a tremendous amount of pioneering sales effort. Distribution must be on a basis that will justify those who are putting forth this effort. All who are contributing to this expense should be rewarded comparably to their contribution, and there is no sound reason for expecting any one branch of the industry to carry all this expense without compensation. If the central station or any other agency does a good selling job, it should receive the merchandising profit and by immediately reinvesting this in further promotional work, the whole question of rapid development will be materially advanced. On this basis central-stations can handle refrigerators just as they merchandise other appliances, and this will greatly stimulate distribution. Their policy should be one of absolutely fair competition and helpful co-operation with all those doing similar work.

ADEQUATE SERVICING VITAL

There seems to be no valid reason why electric refrigeration cannot be installed in the American home entirely in keeping with sound business principles. This device is desirable, many homes are ready to purchase it and the need of the hour is organized sales effort. Also, every progressive central station desires to have its customers enjoying the full advantages of electric service in the home, including domestic refrigeration; for thoroughly satisfied customers making full use of the service tend toward confidence, good-will and better understanding.

Domestic refrigeration has great potential possibilities. To be successful it must meet the requirements of the housewife and must come on the market as a sound business proposition capable of supporting itself on its merits. Under these conditions it is of relatively small importance who actually sells the machines, but any one going into this line of merchandising must realize that the business demands prompt and reliable service twenty-four hours a day, three hundred and sixty-five days in the year. At the present stage of development no one can offer less and be successful. If the housewife is dependent on an electrical refrigerator and if, for any reason, it ceases to operate on Saturday night or Sunday, she cannot wait until Monday for service and lose her food supply while waiting. It requires a higher type of servicing organization for domestic refrigeration than for any other electrical appliance now on the market, and such an organization must always be available to the housewife if the electric refrigerator is to be successful in the home.

ONE YEAR'S SERVICING FREE

On the question of service, the central station is vitally interested. Refrigeration should be sold on a basis of one year's free service, after which period good service should be given at a small profit. Here is where the central station seems to have a decided advantage, because of its already developed service departments operating twenty-four hours a day. But this does not prevent any one else from doing an equally good job.

As I see it, there are no fundamental problems in the merchandising of domestic refrigeration which make it desirable to eliminate the central station from the scheme of distribution. Unquestionably the desired results will be obtained very much sooner if this elimination is not made.

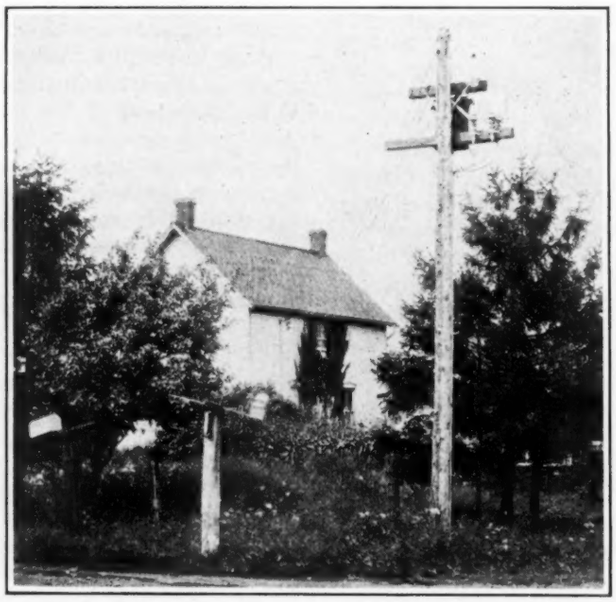
Rural Service in Ontario

Hydro-Electric Power Commission Delivers Energy Directly to Rural Consumers Only—Service and Rates Classified—Engineering and Operating Details—Contractual Relations Established

By L. W. W. MORROW
Managing Editor ELECTRICAL WORLD

THE Hydro-Electric Power Commission of Ontario serves directly about 10,800 rural customers in Ontario over about 1,400 miles of 4,000-volt rural transmission lines. In its normal operations the commission sells all power at wholesale rates to the cities and town of Ontario, and the rural service is practically the only retail service rendered. The reasons for the present rural business are found in past experiences with several methods that have proved unsatisfactory and it is believed the rendering of service directly to rural customers by a large transmission company is the most economical and satisfactory method of conducting this type of utility service. In addition to the rural consumers served by the Hydro-Electric Power Commission directly, several municipalities have rural lines serving a total of about 10,000 customers.

The commission has found the same general difficulties in rendering rural service as has been encountered in all parts of the world and has passed through several stages of development in the business. About 1911 legislation provided for rural service largely through extensions of feeders from the municipalities at corresponding rates and under similar conditions as prevailed in the municipalities. This method was found unsatisfactory for many reasons; rate questions arose, costs were difficult to allocate, administration and operation requirements differed radically from urban conditions and many rural service possibilities were not in close proximity to municipalities. One or more rate-payers in a municipality the corporation of which had not entered into a contract with the commission might apply to the corporation (township) requesting it to obtain from the commission a supply of electrical power for lighting, heating and power purposes, etc. A rate covering the section in which the petitioners were located was given and in some cases a number of widely divergent rates had to be given in the same locality, owing to different densities. Naturally the most thickly populated sections petitioned and were served at a low cost. These sections, usually adjacent to large urban centers, eventually formed a formidable obstacle to extensions in the thinly settled districts. Many of the best farms were unable to procure power owing to the distance from the source, while consumers adjacent to large centers were able to get the benefit at very low rates. As a result of these experiences and in an attempt to co-ordinate and standardize the rural business, legislation was passed in 1920 giving the commission and township corporation authority to supply rural service under better conditions to the farmers.



UNDERGROUND CABLES WITH POTHEAD AND TRANSFORMER FOR OVERHEAD RURAL SERVICE TAP

Under this legislation authority was given to the commission to serve rural customers directly and to form rural power districts. These districts are formed on the basis of a territorial boundary to which a rural distribution system could be supplied economically from a central transformer station or step-down station for a municipality supply. They conform to no geographical or political boundaries and are made or changed by the Hydro-Electric Power Commission and approved by the townships forming part of the rural power district as local conditions warrant. Within these districts rural electric service is given at the same rate for the same class of service. At the present time there are ninety rural districts formed and in operation.

In 1921, to aid rural service still further, legislation was passed whereby the government gave a bonus of 50 per cent of the cost of rural primary distribution lines on the highways of Ontario, and in 1924 further legislation authorized similar bonuses for rural secondary lines. Thus the Government of Ontario now pays 50 per cent of the cost of all construction of rural lines, thereby reducing the interest and sinking fund charges on capital investments one-half.

SERVICE CLASSES AND RATES

Rates for rural customers are based upon service "at cost" and are made up on a secondary basis of classes of service and a subdivision of cost basis. The classes of service are as follows:

Class I. Hamlet service includes service in hamlets, where four or more customers are served from one transformer. This class excludes farmers and power users. Service is given under two sub-classes as follows: Class I-B. Service to residences with more

BACKFILLING UNDERGROUND RURAL TRENCH USING A FOUR-WHEEL ROAD SCRAPER

than six lighting outlets or twelve sockets, and service to stores. Use of appliances over 750 watts permanently installed is not permitted under this class. I-C. Service to residences with electric range or permanently installed appliances greater than 750 watts. Special or unusual loads will be treated specially.

Class II-A. House lighting. Includes all contracts where residences cannot be grouped as in Class I. This class excludes farmers and power users.

Class II-B. Small farm service (less than fifty acres in area). Includes lighting of farm buildings, power for miscellaneous small equipment, power for single-phase motors not to exceed 2-hp. demand, or small electric range. Range and motors are not to be used simultaneously.

Class III. Light farm service. Includes lighting of farm buildings, power for miscellaneous small equipment, power for single-phase motors not to exceed 3-hp. demand, or electric range. Range and motors are not to be used simultaneously.

Class IV. Medium single-phase farm service. Includes lighting of farm buildings and power for miscellaneous small equipment, power for single-phase motors up to 5-hp. demand, or electric range. Range and motor are not to be used simultaneously.

Class V. Medium three-phase farm service. Includes lighting of farm buildings and power for miscellaneous small equipment, power for three-phase motors up to 5-hp. demand, or electric range. Range and motor are not to be used simultaneously.

Class VI-A. Heavy farm service. Includes lighting of farm buildings and power for miscellaneous small equipment, power for single-phase motors up to 5-hp. demand, and electric range, or 10-hp. single-phase motor without electric range.

Class VI-B. Heavy farm service. Includes lighting of farm buildings and power for miscellaneous small equipment, power for three-phase motors up to 5-hp. demand, and electric range, or 10-hp. three-phase motor without electric range.

Class VII-A. Special farm service. Includes lighting of farm buildings, power for miscellaneous small equipment, power for single-phase motors from 10 to 20-hp. demand, and electric range.

Class VII-B. Special Farm Service. Includes lighting of farm buildings, power for miscellaneous small equipment, power for three-phase motors from 10 to 20-hp. demand, and electric range.

Class VIII. Syndicate outfits. Includes any of the foregoing classes which may join in the use of syndicate outfit, provided the summation of their relative class demand rating is equal to the kilowatt capacity of the syndicate.

Class III service is found to predominate, but all classes of service are in use and have been found satisfactory for the conditions encountered in Ontario.

RURAL CHARGES SUBDIVIDED

Charges for power delivered are made up of two parts, a service charge and an energy charge. The service charge constitutes the greater part of the cost and includes operating, maintenance and fixed charges on the

EXCAVATING AN UNDERGROUND RURAL CABLE TRENCH WITH A FOUR-WHEEL ROAD SCRAPER

TABLE I—CLASSES AND DATA ON RURAL CUSTOMERS

Class	Name	Demand Rating, Kw.	Hp.	Average Monthly Kw.-Hr.	Est. Annual Consumption Charge	Est. Annual Service Charge	Total Est. Annual Cost
I.....	Hamlet service, B..	¼	1	15	$8.10	$19.44	$27.54
	C..	½	½	150	42.12	35.64	77.76
II-A...	House lighting.....	1	1½	15	8.10	24.30	32.40
II-B...	Small farm service.	2	2½	35	17.28	37.26	54.54
III....	Light farm service.	3	4	40	21.60	49.14	70.74
IV.....	Medium single-phase farm service.....	5	6½	70	37.80	51.30	89.10
V.....	Medium three-phase farm service.....	5	6½	70	37.80	62.10	99.90
VI-A...	Heavy farm service, single-phase.....	9	12	150	73.22	79.38	152.60
VI-B...	Heavy farm service, three-phase.....	9	12	150	73.22	89.64	162.86
VII-A..	Special farm service, single-phase.....	15	20	300	132.84	117.72	250.56
VII-B..	Special farm service, three-phase.....	15	20	300	132.84	142.56	275.40

lines and equipment required to deliver the power. For farm service an average service charge is about $4 per month as shown in Table I for Class III service. This charge varies with the districts and with the classes of service.

The energy charge is subdivided in two parts; a charge varying from eight to three cents per kilowatt-hour is made for the first fourteen hours' use of a customer's class demand rating, and for all remaining uses a maximum of two cents per kilowatt-hour is charged. The first charge will vary in the different districts, but the two-cent rate for the second part of the charge applies to all districts. For prompt payment of bills a discount of 10 per cent is allowed. In Table I a series of charges is given based on five cents for the first fourteen hours' use of customer's class demand, minimum 30 kilowatt-hours, and two cents for all other energy use.

Rural service is instituted and districts are organized only after a thorough discussion of the whole project with the communities concerned. Meetings are held to explain the system, motion pictures are used to show farm appliances and their uses and occasionaly field demonstrations are held.

After the educational and explanatory work has been done an application from any township for rural service to the Hydro-Electric Power Commission is followed by a letter from the commission outlining to the township and its council the methods to be used in obtaining electric service. This letter explains that the supplying of power in rural districts is conducted as outlined in a legislative act and requires that a contract be executed between the council and the commission that will permit the commission to construct and operate lines necessary to serve the customers and to conduct the business associated with the rendering of service to the customer. It is explained that users of power in the proposed territory will be required to sign a contract with the township and may choose with certain limitations classes of service as given. The construction of the line, it is stated, will be undertaken and paid for by the commission. The farmers in the vicinity of the roads along which the line pass can be used to assist in the construction and will be paid at a suitable rate of wage. Lines constructed from the line on the highway to the customer's premises will be paid for by the customer. The commission explains that it will supply the necessary expert labor to direct the construction of the line and the installation of the equipment, and it is assumed that three farmers per mile of line or the equivalent are obtainable as an average for the entire district it is proposed to serve. The supply of the poles required in the district or the vicinity of the district by efforts on the part of those desiring service may result in a reduction of the cost of construction and a corresponding reduction in the cost of service. As a general rule contractors build the pole lines on the farm property and do the house wiring, but it is the practice to build rural lines in the most economical manner, using the facilities and the labor available in the territory to the best advantage.

CONTRACTUAL RELATIONSHIPS

Should the township prove its case for rural service, a rigid contract is made between the commission and the municipal corporation of the township. This contract is made in legal form according to legislative provisions and is signed only after a sufficient number of customer contracts between the township and the customers have been made to warrant the service from the Hydro system.

It provides that the commission will supply and construct all works on the highways that the commission may deem necessary for the supply and delivery of power to a point on the highway opposite the premises of the customer or other points as approved by the commission. Other clauses provide that it will operate, maintain, renew and administer these works and will render bills and make collections from the customers at rates fixed by the commission. An accounting of the collections is made yearly to the township authorities.

On the part of the township, authority is granted the commission to carry on the business of rural power

DATA ON RURAL POWER DISTRICTS—OCTOBER 31, 1924

	System	Niagara	Georgian Bay	St. Lawrence	Central Ontario and Trent	Ottawa	Total
1.	Number of rural districts	51	11	4	7	1	74
2.	Capital investment in dollars	1,651,475.15	88,514.13	57,605.02	95,157.94	46,981.63	1,906,840.60
3.	Capital grant of province, dollars	812,648.99	35,098.84	27,879.08	50,927.33	26,125.76	1,194,422.71
4.	Miles of rural line	*789.30	52.21	28.61	13.97	25.00	1,205.19
5.	Number of customers						
	Hamlet	6,473	332	101	41	60	10,260
	Farm	2,932	113	57	57	94	
6.	Average load (hp.), corrected for power factor	3,154.42	110.7	89	113.5	54	3,521.7
7.	Revenue collected, dollars	372,833.09	15,787.78	9,462.74	16,598.50	.....	.....
8.	Cost of power purchased from commission, dollars	116,214.99	4,821.19	3,666.06	5,852.88	.....	.....
9.	Operating maintenance and administration charges	71,188.04	2,430.34	2,082.96	4,651.72	.....	.....
10.	Interest on capital	42,676.90	2,824.30	1,837.11	3,970.51	.....	.....
11.	Renewal charges	27,769.64	1,610.08	1,139.27	1,971.89	.....	.....
12.	Sinking fund	12,687.34	999.09	573.55	151.50	.....	.....
13.	Total cost	270,536.81	12,685.00	9,298.95	10,735.63	.....	.....
14.	Share of capital cost of Hydro system on which interest and fixed charges are payable	1,039,000.56	36,012.10	20,218.74	86,306.24	.....	.....
15.	Total capital investment						
	(a) Primary lines	1,017,161.78	57,132.21	44,411.19	61,922.70	30,195.14	1,210,823.02
	(b) Secondary lines	611,443.65	30,335.19	11,961.29	33,235.24	9,002.09	695,977.58

* In the Niagara district there is included 85 miles of lead-covered cable.

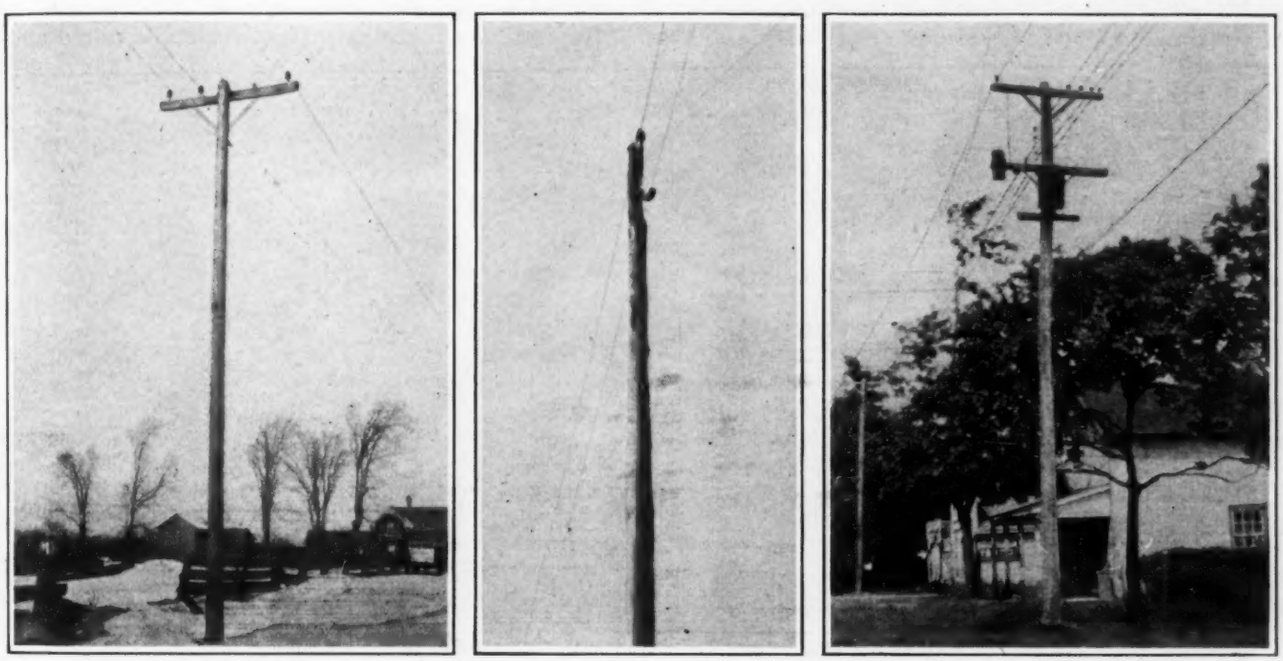
distribution in the area or areas laid out or defined from time to time by the commission. Authority is given the commission to occupy and use the highways and public places in the township for rural power business purposes and to enforce all contracts.

The corporation of the township guarantees to the commission its proportionate share of all costs, as adjusted by the commission, incurred in the supply of power. These costs include the cost of power delivered at the commission's point of supply for the township or rural supply district and involve the township's proportionate share of interest and sinking fund charges, operating, maintenance and administrative costs and costs incurred in renewals and insurance of the works needed in the business. Also interest at rates payable by the commission upon money expended shall be paid to give an annual sum sufficient to form, in thirty years with interest at 4 per cent per annum, a sinking fund for the repayment of capital charges.

Authority is given the commission to render bills periodically, discontinue service if bills are unpaid and collect from the corporation of the township the bills of delinquent customers. The contract is made for a thirty-year period.

The individual customer contracts are between the corporation of a township and each customer and these are preliminary to the supply of power by the commission and the signing of the major contract. The individual contracts cover the class of service desired, the location of the service and some general conditions. The customer must provide all lines on his premises and all lines connecting his premises with the point of power delivery, and contracts to maintain a power factor of 80 per cent at maximum load using motors up to 10 hp. in size and 85 per cent when motors over 10 hp. in size are used. The customer contract is for a twenty-year period.

In conformity with recent legislation the government pays 50 per cent of the cost of primary and secondary lines and equipment constructed along the highway or along the right-of-way for the supply of rural service. Charges for power, as have been stated, are based on two parts, a service charge and a consumption charge. The service charge, which constitutes the greater portion of the total cost of power delivered, consists of the operating, maintaining and fixed charges of the lines and equipment required to deliver the power to the users in the district. Consumption charges are determined by meters located at each customer's premises. The cost of power is arrived at when the amount used has been determined and the rate used in any district will be determined by the cost of power at the source of supply to the district. The power supply to the district is metered at the transformer station or source of power supply to any district. The rates in any district are readjusted by the commission annually to cover the changes in cost. A change in the average number of farmers per mile or in the cost of power changes the annual cost for all parties.



AT LEFT, TYPICAL THREE-PHASE WOOD POLE LINE CONSTRUCTION. IN CENTER, SINGLE-PHASE RURAL CONSTRUCTION USING PIN AND SIDE BRACKET. AT RIGHT, EXAMPLE OF JOINT USE OF POLE BY RURAL LINE AND TELEPHONE CABLE

Bills are rendered to the consumers by the commission quarterly and if the bills remain unpaid for sixty days, the commission may in addition to all of the remedies and without notice discontinue the supply of power to the customer until the bill is paid. All payments in arrears bear interest at the legal rate and are collected and paid for, if necessary, by invoking the law making the township itself responsible for the customer's payment.

About one-third of the rural lines are three-phase and two-thirds of them single-phase. The Class III type is the popular farm service; this permits the use of a 3-kva. transformer and this will allow the use of one range or a 3-hp. motor, which are not supposed to be on the line and operated at the same time. Generally speaking, 4,000 volts with a neutral ground is used as a standard and 30-ft. poles with 6-in. tops of the Eastern cedar type with 160 ft. maximum spacing between poles are used. For the three-phase service a $3\frac{3}{4}$x$4\frac{3}{4}$-in. cross-arm with 30-in. climbing space and 18 in. between outside and inner pins is used with No. 6

hard-drawn bare copper conductors. In some cases 250-ft. spacing with No. 4 steel reinforced aluminum conductors is used. On the single-phase lines, which supply about 50 per cent of the services, the top pin and side bracket with a wet process porcelain insulator for phase wires and glass insulators for neutral wires are used. Glass insulators are used on the 120-volt services and the transformers are mounted on the poles below the secondary line for ease of maintenance.

Joint use of poles with the telephone companies is practiced with a limitation of 5,000 volts, and experience has shown that liability in the event of accidents is the most troublesome problem to be worked out in connection with the joint use operation. As the power wires are placed on top, it is very difficult to handle situations caused by falling wires if damage claims are based on the fact that the wires that come in contact with the telephone circuit are responsible for the damage because of their position.

If the right-of-way is difficult to obtain in a congested district or the territory is heavily wooded along the highways, such as near Hamilton, some very satisfactory services have been rendered using underground lead cables. This was found cheaper than the overhead service under these conditions. Three single-phase lead-covered rubber-insulated single-conductor No. 6 stranded copper 2,500-volt cable costing about nine cents a foot is run as a major trunk three-phase system to the territory to be served and then single-phase taps are taken off for side-road services to customers. In the Hamilton district there is about ten miles of the three-phase bus and 700 single-phase services are tapped from this, giving a total underground cable installation of about eighty-five miles.

After experiences with many construction methods, the best results were obtained by using standard farm plows and teams and a common road scraper. A trench is made near a fence next to the road about 18 in. deep and the cable is placed in the earth. In the case of the three-phase system a little space is left between the three cables so no direct contact can be made. For the single-phase the lead sheath is used for the return and the conductivity is found equivalent to about No. 10 copper wire. To secure a service tap, a 25-ft. pole is erected and without breaking the cable a loop is made by extending it up the pole and down again and a regular cable end bell is then placed for tapping through a jumper. A lead is taken to the transformer on that pole and to the lead sheath return. A bracket is placed on the side of the pole with 110-220 service going to the house through an overhead circuit. It is thought that it may be possible ultimately to work toward burying transformers in the ground and putting the secondaries underground also.

Rural service has had an appreciable effect on developing agriculture in Ontario. Electricity in the houses and barns has made farm life easier and more attractive. The application of electricity for general farm work other than in the homes and barns has not gone far and the general experiences as to the cost of rural service, the quality of construction required and the density of load necessary for profitable service are similar to those encountered in many other properties.

LAYING A RURAL UNDERGROUND CABLE WITH MOTOR-DRAWN REEL

It has been thought inadvisable to tap high-voltage lines for rural service, because of the hazards introduced to the major trunk power systems. In nearly all districts the rural load has grown rapidly and over a period of several years, in sixty-five of the districts the service charge has decreased 5 to 40 per cent and in fifty-seven of the districts the meter rate has been reduced by from 5 to 25 per cent. In the Niagara system, for example, which has the largest number of rural districts, there were fifty-one districts as of Oct. 31, 1924, of which seventeen were added during 1924. In thirty-six of these districts the load increased during the year. This increase ranged from 0.5 to 512 per cent and averaged 49.1 per cent for those districts in operation the full year. Ten districts had a decrease in load during the year ranging from 1.8 to 28.1 per cent.

As of Oct. 31, 1924, there was 7,185 suburban customers, 7,883 hamlet customers and 4,682 farm customers on the Niagara system, and a total of 7,124 hp. was supplied these customers. Some rural districts have not grown and loads have remained stationary or decreased, but as a whole rural service has been an enterprise that has paid its way with the aid of the government and has meant a great deal to the building up of the territory.

Lock 18 Development in Alabama

Work Starts on Project to Give 120,000 Kw. in Five Units— Details of Installation and Plans for Construction— Open Roof Type Power House

By F. G. SWITZER

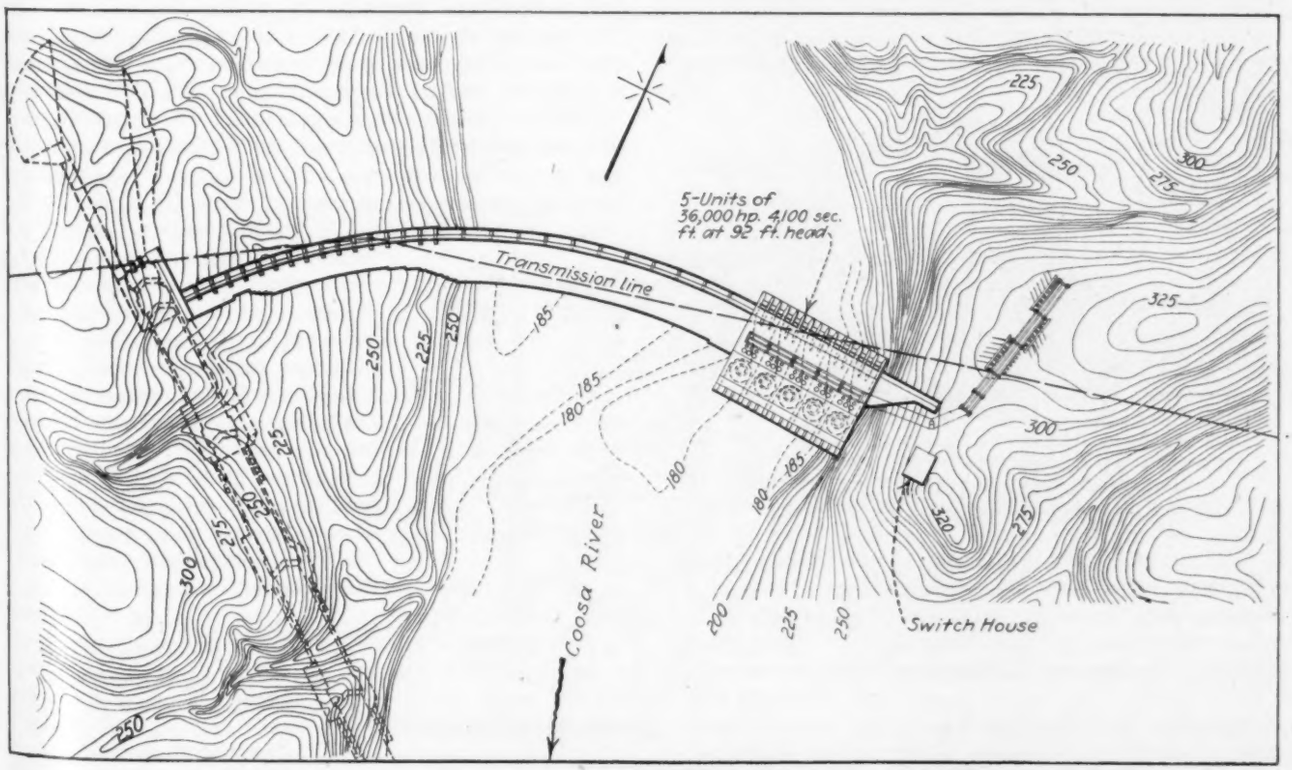
Professor, Cornell University, and Consulting Engineer, Alabama Power Company

ON JUNE 13 the Alabama Power Company made application to the Federal Power Commission and to the Alabama State Public Service Commission for the necessary authority to proceed with the construction of a water-power development on the Coosa River. This project is known as the Lock 18 development. It derives its name from the designation given the site in the report on the improvement of the Alabama and Coosa rivers made by Major Cavanaugh and printed as House Document No. 219, Fifty-eighth Congress. This report is dated June 30, 1904. The Lock 18 dam is to be located in Elmore County, Alabama. It is eighteen miles downstream from the recently completed Mitchell Dam, seven and one-half miles upstream from Wetumpka, and Montgomery is only twenty-two miles by road.

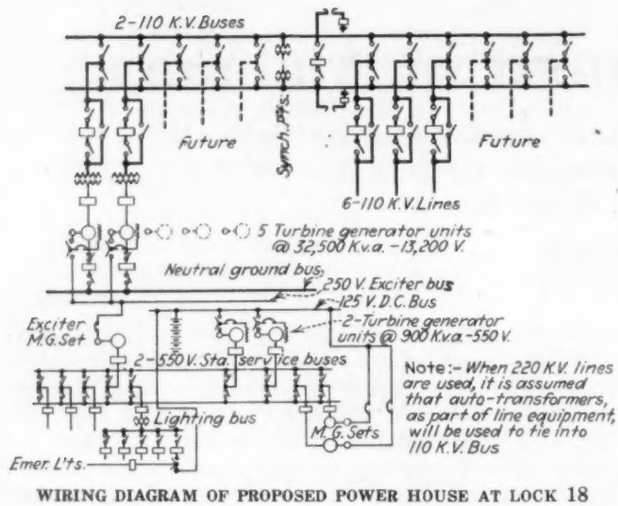
This project is not a new idea. A low dam was advised for this site in 1904 and again in 1913 in the report of Major Ferguson (House Document No. 253, Sixty-third Congress, First Session) for navigation purposes. In 1912 Congress passed a bill authorizing the construction of a dam on this site, but the bill was vetoed by President Taft.

In 1924 the generation of the Alabama Power Company was 823,246,000 kw.-hr. The five-minute demand has exceeded 200,000 kw. New plants are required with increasing frequency. Studies of predicted loads indicate that energy from the Lock 18 plant will be required to meet economically the demand for power as soon as the construction can be completed. A line from the dam site extending to the Mississippi state line via Selma and Demopolis is now under construction. Another line through Flomaton is proposed for the near future to carry energy to Pensacola and Mobile. The Lock 18 project is advantageously situated to carry these loads in connection with the necessary steam plants. The air line distances for these lines are about 125 miles and 170 miles respectively. Condenser regulation is planned. The voltage will be 110 kv. and 220 kv., depending upon load and distance.

The dam is to be about 110 ft. high, raising the reservoir level to the height of the Mitchell Dam tail water. The head so created will of course vary with reservoir and tail water level, but the so-called normal head will be 95 ft. The ultimate capacity now planned is 120,000 kw. in five units. The water wheels are to be rated 36,000 hp. at 92 ft. head and will run at 100 r.p.m. The generators will be 32,500 kva., 80 per cent power factor, 13,200 volts, 60 cycle, three phase. Some slight changes in rating may be made before final plans are completed. In the applications filed for permit the company states that it expects to install two



PRELIMINARY LAYOUT OF DAM AND POWER HOUSE AT LOCK 18


2-110 K.V. Buses
Future
Synch. P.P.s.
Future
6-110 K.V. Lines
5 Turbine generator units @ 32,500 K.v.a. -13,200 V.
Neutral ground bus
250 V. Exciter bus
125 V.D.C. Bus
Exciter M.G. Set
2-Turbine generator units @ 900 K.v.a. -550 V.
2-550 V. Sta. service buses
Note:- When 220 K.V. lines are used, it is assumed that auto-transformers, as part of line equipment, will be used to tie into 110 K.V. Bus
Lighting bus
M.G. Sets
Emer. L'ts.

WIRING DIAGRAM OF PROPOSED POWER HOUSE AT LOCK 18

of the units at first and add the three others from time to time as the load requires. The ultimate plant capacity and volume of construction will be about the same as the Cherokee Bluffs development of the same company, now under construction on Tallapoosa River.

It is proposed to operate the new plant on the unit system. No low-tension power buses are contemplated. Each generator and its bank of transformers will be operated as a unit. A low-tension oil switch will probably be placed in the generator leads for protection. The transformers will step up to 110 kv. at the power house. Two high-tension buses will lead to a switching station on the river bank. Studies have been made under the assumption that if 220-kv. lines are required they will be connected to the 110-kv. station by means of auto-transformers. Two house service hydro-electric units are planned, each rated at 900 kva. Each generator will have its own direct-connected exciter.

In the interest of navigation this new dam is an important step forward. The pool formed by the Lock 18 dam will add eighteen miles to the navigable length of the Coosa River.

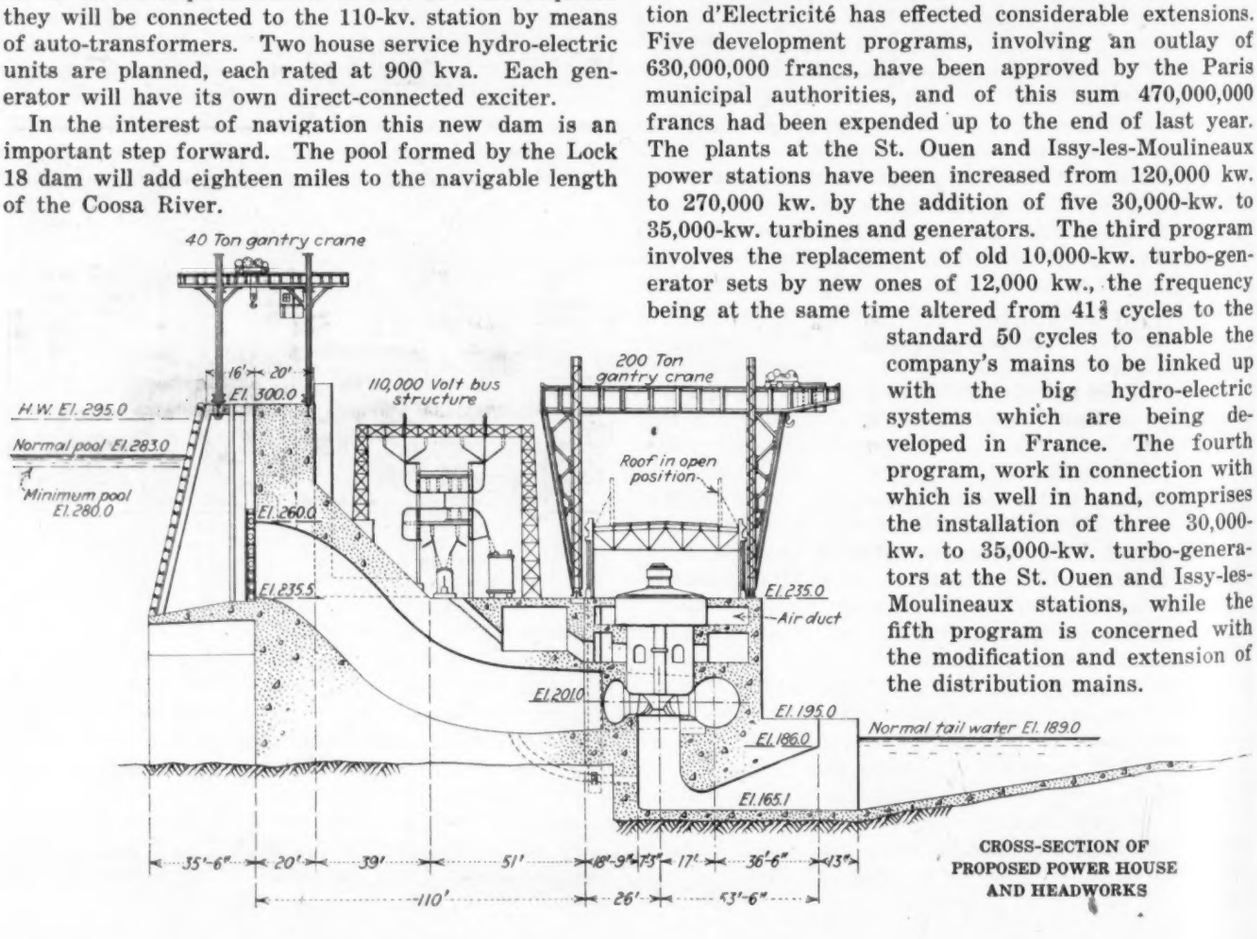
The area of the reservoir will be 4,800 acres. The volume of water storage is small, sufficient only for daily or weekly load variations in the dry season. This plant, as well as the two other large plants on the Coosa River, Lock 12 and Mitchell Dam, is a "run-of-river" project, using the water as it comes or wasting it. The "storage" plant at Cherokee Bluffs, together with the large steam plants on the system, will supply deficiencies in generation.

Very careful investigations of foundations have been made. Forty-five test holes were sunk and a number of these are being deepened by diamond drilling. The foundations have been reported upon and approved by W. O. Crosby and S. J. Loyd, geologists. Power studies have been carried through at great length. At the present time (July) the Dixie Construction Company is laying plans for construction plant, railroad connections and camp facilities. Although the formal applications have not yet been acted upon, it is hoped to be able to start work by December of this year and to place the first unit of the plant in operation three years later.

All work is being carried on under the direct supervision of O. G. Thurlow, vice-president and chief engineer of the Alabama Power Company, and A. C. Polk, construction manager of the Dixie Construction Company. S. H. Woodard is consulting engineer.

Summary of Electrical Growth in France

SINCE the termination of the war, to meet the ever-increasing demand for electricity supply in the Paris district, the Compagnie Parisienne de Distribution d'Electricité has effected considerable extensions. Five development programs, involving an outlay of 630,000,000 francs, have been approved by the Paris municipal authorities, and of this sum 470,000,000 francs had been expended up to the end of last year. The plants at the St. Ouen and Issy-les-Moulineaux power stations have been increased from 120,000 kw. to 270,000 kw. by the addition of five 30,000-kw. to 35,000-kw. turbines and generators. The third program involves the replacement of old 10,000-kw. turbo-generator sets by new ones of 12,000 kw., the frequency being at the same time altered from 41⅔ cycles to the standard 50 cycles to enable the company's mains to be linked up with the big hydro-electric systems which are being developed in France. The fourth program, work in connection with which is well in hand, comprises the installation of three 30,000-kw. to 35,000-kw. turbo-generators at the St. Ouen and Issy-les-Moulineaux stations, while the fifth program is concerned with the modification and extension of the distribution mains.



CROSS-SECTION OF PROPOSED POWER HOUSE AND HEADWORKS

Manufactured Ice—An Opportunity

Potential Market for 3,072,000,000 Kw.-Hr. and Revenue of $46,080,000—Economies of Electrified Plants—Distilled Water No Longer Necessary—Financing of Electrification Often the Greatest Problem

By A. J. AUTHENREITH
Vice-President Middle West Utilities Company, Chicago

A STUDY of the growth of the manufactured-ice business during the past twenty years reveals some remarkable facts regarding the size of this industry and its possibilities as a revenue producer for the central station. In Table I and Fig. 1 are shown indications of past and future growth of the manufactured-ice business. In 1904 there were 2,218 plants manufacturing 10,000,000 tons of ice annually, while in 1923 there were 5,747 plants with an annual output of 36,842,400 tons, of which 5,000,000 tons were used in railroad refrigerator cars. Authoritative prediction has placed the manufactured-ice business in 1940 at 8,160 plants, having a daily production of 400,000 tons and an annual production of 60,000,000 tons. In 1904 the per capita consumption of manufactured ice was 240 lb., by 1923 it had increased to 664 lb., and the per capita consumption of manufactured ice for 1940 has been estimated at 945 lb. (Table II and Fig. 2). The manufactured-ice business of the country represents an investment of $600,000,000.

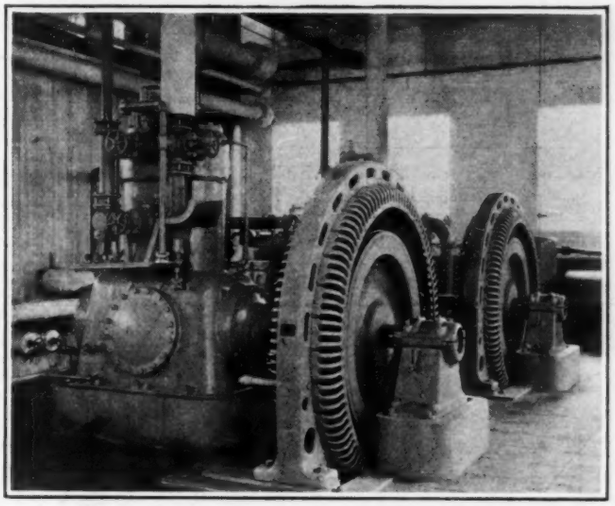
In a recent survey of 4,384 plants it was found that 2,066 were steam plants, 1,944 electric plants, 290 oil-engine plants and 84 gas-engine plants. During 1923 the number of oil-engine and gas-engine plants increased by approximately 100, the number of electric plants increased by 648 and the number of steam plants decreased by 700. Motor-driven plants increased during 1924, while steam-driven plants continued to decrease. Electrically driven plants at present constitute approximately one-half of the ice-manufacturing capacity of the country, oil-engine plants constitute only a small fraction and steam plants are actually decreasing in number.

Load Possibilities with 80 per Cent Electrification

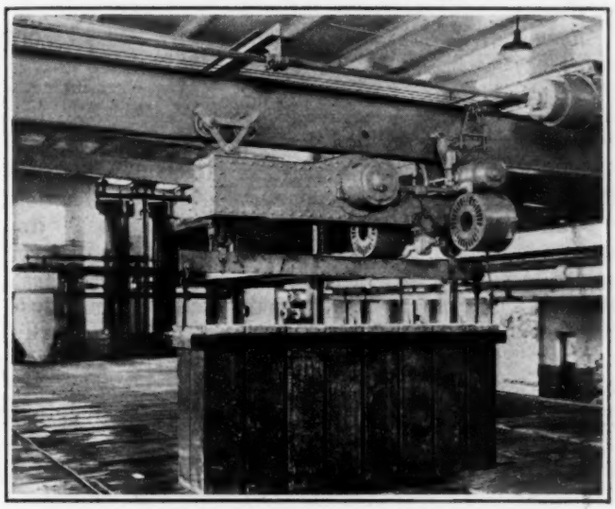
Practically 80 per cent of the ice plants in the country can be successfully and economically electrified. In the larger cities more than 95 per cent of the ice plants are electrically driven.

The average energy consumption by an electrically driven ice plant amounts to 64 kw.-hr. per ton of ice manufactured. The average motor installation of a modern plant is 4 hp. per ton of ice-making capacity. This includes all power used for lighting, water pumping and refrigeration of storage room, as well as ice production.

In 1923 there were manufactured 36,842,400 tons of ice. Had 80 per cent of this ice been made with purchased power, the consumption of electrical energy from central stations for its manufacture would have amounted to 1,886,330,880 kw.-hr. This is an energy consumption greater than that of any single industry in the United States purchasing power (1923), with the exception of "iron and steel and its products." This is an output of electrical energy equivalent to that of the largest power company of the world for 1923. Had all this energy been sold by central stations at an average rate of one and one-half cents per kilowatt-hour, the gross revenue from this load would have amounted to $28,294,763.

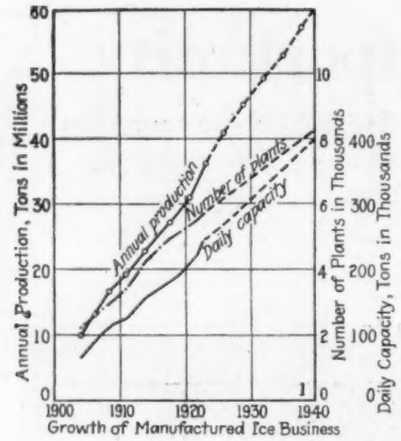


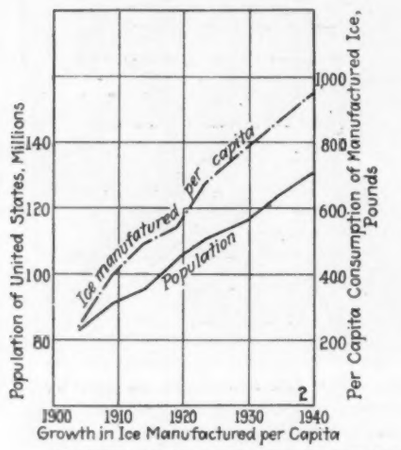
THIRTY-TON AND TWENTY-TON ICE MACHINES, DRIVEN BY SYNCHRONOUS MOTORS HAVING ALL NECESSARY FLYWHEEL EFFECT BUILT INTO ROTOR

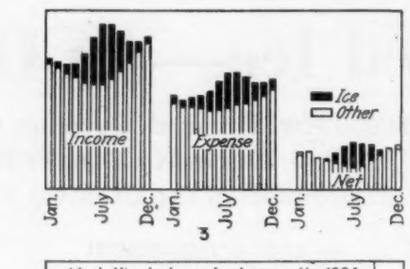


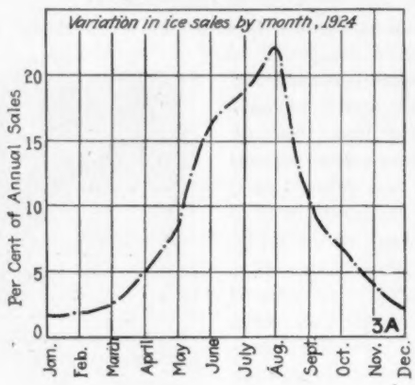
ELECTRIC CAN HOIST PULLING EIGHT 300-LB. CANS. THE DEVELOPMENT OF THE ELECTRICALLY DRIVEN CAN HOIST HAS REDUCED THE LABOR REQUIRED IN ELECTRICALLY DRIVEN PLANTS

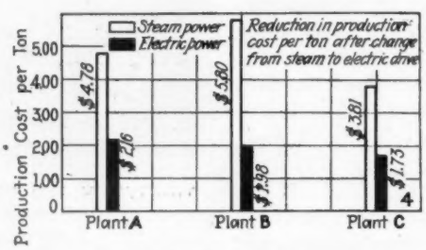
Consider now the possibilities of this industry as indicated by the predicted consumption of ice in 1940. The expansion of ice plants necessary to care for the




Population of United States, Millions
Per Capita Consumption of Manufactured Ice, Pounds
Ice manufatured per capita
Population
2
Growth in Ice Manufactured per Capita







GROWTH OF MANUFACTURED ICE BUSINESS AND EFFECT OF ELECTRIFICATION

Fig. 1—The use of manufactured ice in the United States has increased during every year for the past twenty years.

Fig. 2—Growth in ice manufactured per capita.

Fig. 3—Relation of ice business to other businesses. Six years ending 1922.

Fig. 3a—Variation of ice sales by month: 70 per cent of all ice sales occur during warm months.

Fig. 4—A remarkable reduction in operating expenses accompanies the conversion of manufactured ice plants from steam to electric power.

The effect of ice-plant load on the average public utility's electric system is very beneficial, because the lighting load of central stations begins to drop in April, reaching a minimum in July and then gradually increasing until it reaches a maximum in December or January. On the other hand, the ice plant load becomes active in April, reaching its peak in July and decreasing until it is a minimum in December and January.

The beneficial effect of ice plant earnings on the total earnings of a combined utility and ice business is shown graphically in Fig. 3. In the case of one large utility operating many ice plants, the net earnings from its ice business during July were greater than the net earnings from electric operations. With the general adoption of direct-connected, synchronous motors for compressor drives, the ice plant load has become one of excellent power factor.

ECONOMIES WITH ELECTRIC POWER

The accompanying illustration, Fig. 4, shows the economies effected in three ice plants where the power supply was changed from steam to electricity. Two of the plants were originally of the absorption type and one of the compression type and all were converted to the motor-driven, compression type. A detailed statement of the economies as applied to these specific plants is shown in Table III.

In the case of new plants, electrification effects a large saving in first cost. This initial saving comes from the elimination of the boiler plant and from economy of space in the compressor room, due to the more compact arrangement of the electrically driven machinery and absence of piping and steam auxiliaries.

Economies of operation of the electric plant compared with the steam plant are chiefly in the items of power, labor and plant maintenance. A well-designed electric plant of fifty tons ice-making capacity or less can be operated by one man per eight-hour shift, and plants of 100 tons capacity can be operated by two men per

demand for ice in 1940 calls for 150,000 additional tons of daily ice-making capacity. The electrification of this additional equipment would require 600,000 hp. in electric motors. A market for 600,000 hp. in electric motors is worthy of consideration by even the largest electrical manufacturers. To the central-station industry, the production of 60,000,000 tons of ice annually in plants 80 per cent of which are electrically driven would mean the consumption of 3,072,000,000 kw.-hr. annually. This is equivalent to the entire consumption of the iron and steel industry in 1923. At a rate of one and one-half cents per kilowatt-hour, this would produce an annual central-station revenue of $46,080,000.

TABLE I—GROWTH OF MANUFACTURED ICE BUSINESS

Courtesy Ice and Refrigeration

Year	No. Plants	Capacity Tons per Day	Est. Output Tons (150 Days)
1904	2,218	66,220	9,993,000
1909	3,000	117,000	17,500,000
1911	3,406	123,156	18,473,400
1914	4,245	158,200	23,730,000
1919	5,117	187,864	28,179,600
1922	5,500	222,891	33,433,650
1923	5,747	245,616	36,842,400
Expected Increase			
1929	6,600	300,000	45,000,000
1934	7,300	342,000	51,300,000
1940	8,160	400,000	60,000,000

TABLE II—ICE MANUFACTURED PER CAPITA

Courtesy Ice and Refrigeration

Year	Population	Est. Ice Mfd. per Capita, Lb.
1904	82,700,000	240
1909	90,300,000	388
1914	97,500,000	488
1919	104,500,000	540
1923	110,000,000	664
1929	117,500,000	770
1934	123,500,000	850
1940	130,500,000	945

shift. This is a saving of at least 50 per cent in the labor charge. The saving in maintenance may be readily seen from the elimination of the boiler plant, steam piping and steam-driven auxiliaries. There is a further saving in the amount of ammonia used, due to the more constant speed and more uniform pressure obtained from electrically driven machines. As shown in the accompanying table, the saving in the production cost of ice may run as high as 70 per cent when the plant is converted from steam operation to electric operation. If to this saving is added the further economy in investment charges, the case for the electrically driven plant becomes unassailable.

WATER CONDITIONS IMPORTANT

No factor influences the manufacturing of satisfactory ice more than water. Of first importance is the temperature of the water available, inasmuch as the power input varies almost in direct proportion to the temperature of the cooling water available. If the initial temperature is high, more cooling surface is required in the condenser and a larger volume of water is required to absorb the heat.

The relative amount of solids contained in the water used in the ice cans is important, as this content of solids determines the character and extent of the water-treating plant necessary. The importance of water treatment is realized when it is remembered that in the formation of a cake of ice all the solids are frozen out of the water and appear in the core of the cake. Consequently, this central portion of the cake has a very high concentration of solids compared with the original water used in filling the cans. For example, if the water contains ten grains of solids per gallon, the can holding 38 gal., and if the core contains 1 gal., the concentration of solids increases, as the ice freezes, from ten grains per gallon in the original can water to 380 grains per gallon in the core. This concentration of solids in the center of the block of ice must be removed and the core refilled with fresh water to prevent the formation of a white or colored opaque core in the ice cake. Treatment for ice cores consists mainly of treatment of the fresh water by means of coagulation and filtration and the agitation of the water in the can by means of compressed air. When the water-treating installation is designed for the quantity and quality of water found at the specific location and when the proper type of air agitation is used, an excellent cake of clear ice is produced.

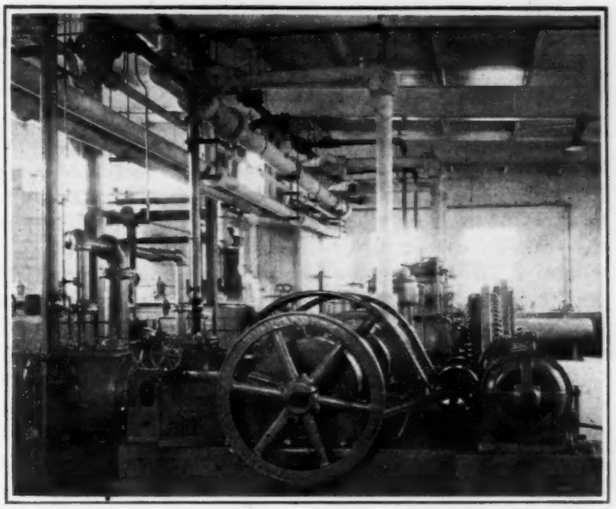
TABLE III—REDUCTION IN PRODUCTION COST PER TON OF ICE IN THREE PLANTS CHANGED FROM STEAM TO ELECTRIC DRIVE

	Plant A-30 Ton		Plant B-30 Ton		Plant C-10 Ton	
	Steam	Electric	Steam	Electric	Steam	Electric
May	$6.00	$2.08	.....	.....	$4.30	$3.76
June	6.35	2.28	$4.26	$1.55	5.40	2.67
July	4.15	2.02	3.24	1.80	4.05	2.11
August	5.30	2.05	4.00	1.94	5.40	1.54
September	10.25	1.65	4.00	1.54	4.13	1.71

These plants were changed from steam to electric drive between seasons. Figures show production costs only; no fixed charges included.

Detail of Comparative Production Costs

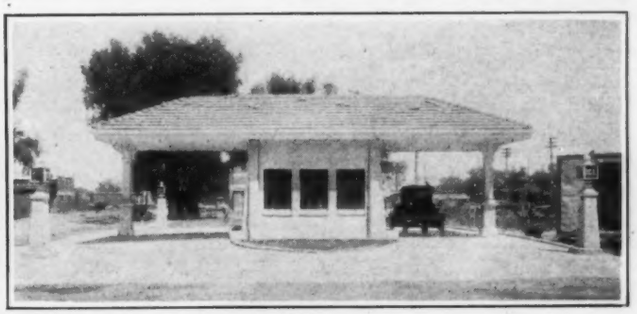
Plant A:				Per Cent
Tons manufactured increased			450	47.0
Cost per ton manufactured	1921	1922		
Labor	$1.25	$1.10		
Fuel	2.14	.....		
Power	.34	.84		
Ammonia	.....	.....		
Maintenance	.83	.08		
Miscellaneous expense	.22	.14		
Total	$4.78	$2.16		
Plant B:				
Tons manufactured increased			368	9.4
Cost per ton manufactured				
Labor	$2.08	$0.90		
Fuel	1.49	.....		
Power	.06	.64		
Ammonia	.05	.....		
Maintenance	1.77	.34		
Miscellaneous expense	.35	.10		
Total	$5.80	$1.98		
Plant C:				
Tons manufactured decreased			37	1.3
Cost per ton manufactured				
Labor	$1.31	$0.72		
Fuel	1.73	.....		
Power	.01	.56		
Ammonia	.03	.....		
Maintenance	.59	.26		
Miscellaneous expense	.14	.19		
Total	$3.81	$1.73		



MOTOR-DRIVEN COMPRESSORS SUPPLY COMPRESSED AIR TO AGITATE WATER IN CANS, PRODUCING CLEAR, CRYSTAL ICE

DISTILLED WATER NOT NECESSARY FOR GOOD ICE

With modern water-treating and air agitation methods available, it is no longer necessary to use distilled water for filling the ice cans and therefore it is possible to operate ice plants much more economically than when only distilled water could be used. But with the elimination of the requirements for distilled water the chief



CASH-AND-CARRY STATIONS ARE OPEN DAY AND NIGHT IN MARSHALL, TEX.

need for a steam plant disappears and consequently electric power can be utilized to great advantage in the production of ice in modern fresh water ice plants.

FINANCIAL PROBLEMS

There is little difficulty in convincing the builders of a new ice plant that all machinery should be electrically driven, but it is not always possible to convince owners of existing plants that they should make the change to electric drive immediately. Even with a reduction in operating expense of as much as 70 per cent it is sometimes difficult to induce owners of existing steam plants to scrap steam equipment and install electrically driven machinery. The reason for this difficulty is largely in the expense to which the owner will be put in making the change. Although it is usually possible to show a handsome return on the new investment, it is not always possible for the owner to raise the capital with which to make the change. It is generally no more difficult or expensive to change an absorption type of plant to electric drive than it is to change the compression type of plant. In either case the boiler plant is scrapped and new compressors are generally necessary, as many of the older type of steam-driven compressors are not suited to economical electric drive. Then, too, it is generally necessary to install compressed air equipment and air lines in the tank room. The cost of these changes, together with the necessary building remodeling, although considerable, is not so great as to prevent the earning of a large return on the investment required.

While utility companies are ever ready to scrap existing equipment and buy new equipment to effect economies in operation, directors of ice companies and banks that furnish the new capital for electrification must be sold on such a policy before extensive electrification of existing ice plants can be expected.

Electrolytic Hydrogen Plant for France

A CONTRACT has just been entered into by an electrolytic plant company in Chester, England, for an electrolytic hydrogen plant in France. The concern operates the Knowles patents and the contract has been placed with it for 600 Knowles standard-type cells each passing 7,500 amp. at 2.5 volts, arranged in three batteries with 200 cells in each. The total production will be more than 70,000 cu.ft. of hydrogen and 35,000 cu.ft. of oxygen per hour, and the power used will be 11,250 kw.-hr.

These cells are of the multipolar type. Different capacities are obtained by assembling different quantities of standard electrodes and gas-collecting bells. The peculiar features of the cell are (1) the "staggered" leads attached to the electrodes, giving a perfectly even distribution of electricity over the surface of the electrodes; (2) the substitution of "hydraulic" seals for glands in passing the lead through the gas bells, permitting a simple insulation of these leads; (3) the S-pipe gas mains carried by the cells, with an almost vertical glass tube insulator between each two cells, so that at no point in the main is there a greater difference of potential than that between two adjoining cells, while the insulating glass tube, being nearly vertical instead of horizontal, remains free from liquid, guarding against a short circuit at that point; (4) "safety" tubes in every cell, so that if the supply of water to the cell is insufficient the gas blows away from these tubes and the diaphragms cannot be exposed; (5) washing of the outgoing gases by the incoming water feed, which is automatically controlled. Recent plants of this type are producing 100 per cent hydrogen, 99.9 per cent oxygen.

It is some time since cells of this kind were installed for Lever Brothers, Ltd., at soapworks at Bromborough, Durban, Kobe and Sydney, and it is due largely to their high efficiency and low maintenance costs that they were selected for the large installations at Bussi, in Italy, and at Soulom, in the French Pyrenees, for the production of hydrogen for use in the manufacture of synthetic ammonia.

The Bussi installation is of particular interest, as the plant is run at varying loads during the day, using the surplus power from one of the hydro-electric plants supplying Naples with electricity. The electrolytic production of pure hydrogen and oxygen is one of the few electrochemical processes which do not require constant current. The cells can run at all loads, from quarter up to full load, and can be shut down and started up instantly. At an average of 2 volts per cell the production per kilowatt-hour is about 8 cu.ft. of hydrogen and 4 cu.ft. of oxygen. At 2.5 volts the output per cell is trebled, but the production per kilowatt-hour is reduced to about 6.4 cu.ft. of hydrogen and 3.2 cu.ft. of oxygen.

New Hydro-Electric Plans in Italy

A SYNDICATE supported by the authorities of the four Italian provinces of Alexandria, Cuneo, Novara and Imperia has drawn up plans for the utilization of the water power of the River Tanaro. The scheme provides for the construction of five artificial lakes above the town of Ceva with a total capacity of approximately 13,640,000,000 gal. or 2,190,000,000 cu.ft., and for five hydro-electric stations, three of which would supply energy in the Piedmont district and two in the Ligurian, the aggregate annual output of the plants being about 182,000,000 kw.-hr.

Letters from Our Readers

Utility Company as Traffic Signal Consultant

To the Editor of the ELECTRICAL WORLD:

Referring to your editorial on "Utility Companies as Consultants on Electric Traffic Signals" in the August 29 issue of the ELECTRICAL WORLD, we do not recall any central-station company which installs and maintains traffic signals.

The South Park Board as well as the West Park and Lincoln Park Boards, Chicago, all use traffic signal posts on important boulevard intersections, and we are pleased to state that their installations are 100 per cent "Reco." Some of the later traffic controls have been in use as long as three years, and we doubt very much if the entire repair bill covering some two hundred controls has run over $75. We build a special timer or control embodying the same basic principles that we utilize on flashers for electric signs, which we have manufactured successfully during the past twenty-five years, and these principles represent the strength of "Reco" traffic controls and timers. O. D. ZIEGLER,

Reynolds Electric Company. President.
Chicago, Ill.

Central Station and Industrial Practice

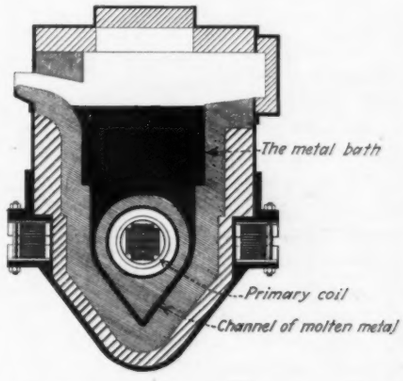
Induction Furnaces in Large Brass Mill

ONE of the largest and most successful installations of electric induction furnaces in the country is operated by the American Brass Company at its mill at Kenosha, Wis. Twenty-four Ajax-Wyatt induction electric furnaces are in operation here. These furnaces have a nominal charge capacity of 600 lb. and are designed for operation at 230 volts, single-phase, sixty cycles, drawing an average current of 400 amp. with a power factor between 60 per cent and 75 per cent. The furnaces are connected in delta to a three-phase bus mounted under the casting floor. Flexible conductors run from the bus to each of the electric furnaces.

Stationary molds are used, and it is therefore necessary to carry the furnaces to the molds at time of pouring. This is taken care of by an overhead traveling crane.

A cross-section of one of the furnaces is shown in the accompanying illustration. The electrical element consists of a single primary coil of from thirty-six to forty-two turns about an H-shaped iron core. The molten metal in the furnace constitutes a one-turn secondary. The melting is done in a V-shaped ring built into a refractory block surrounding the primary coil and core. This ring has a cross-section of 3¼ in. x ¾ in.

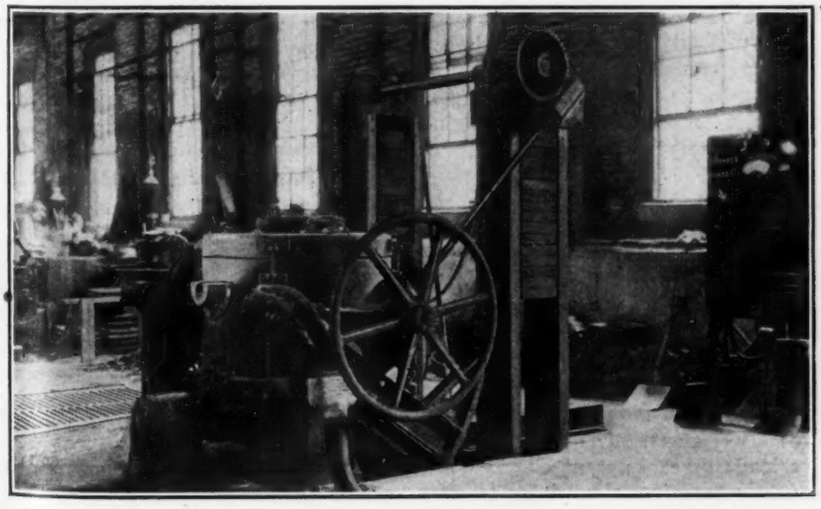
About fifty minutes is required to melt down a heat and twenty minutes for pouring. During the pouring period, eighty volts is applied to the furnace for holding the heat. This "stand-by" service is supplied from a separate bus and a separate bank of transformers.. A certain amount of metal is left in the furnace after pouring in order to maintain the secondary circuit.



CROSS-SECTION OF ELECTRIC INDUCTION FURNACE

Through several years of operating experience and considerable individual research, a lining composition and construction have been evolved that have enabled the furnace to establish an enviable record of operating and maintenance expense. Whereas the furnaces when first installed gave only a few heats per lining, they are now producing more than 1,000,000 lb. of metal per lining and at times have produced 3,000 heats and 1,800,000 lb. of metal without relining. The temperature at which the metal melts has much to do with the life of the lining, and it has therefore been found that brasses having a high percentage of copper have a shorter lining life than those with a low percentage of copper. Because of the great variety of brass products made at the Kenosha plant, the composition of succeeding heats of a given furnace change frequently, with the result that the life of the linings is somewhat different than if the same composition of metal were melted in every heat.

The average performance of the furnace on the various grades of metal produced has been 9 lb. of metal per kilowatt-hour. With an average rate of $0.0125 per kilowatt-hour, the average cost of current has been $0.0014 per pound of metal melted. With twenty-four furnaces in practically constant operation and with the modern material handling methods utilized on the casting floor, the labor cost per pound of metal melted is very low.



INDUCTION FURNACE IN OPERATION WHERE LADLE OR MOLDS ARE BROUGHT TO FURNACE

Automatic Substations in Germany

BY JOSEPH ROUBICEK
Brookline, Mass.

THE unfavorable economical conditions of the after-war period have been a serious handicap to technical development in Germany, and it is only since the last year that German public utilities have been able to venture into new enterprises. While automatic substations have been used successfully during the past ten years and have become fairly well standardized, Germany has had until quite recently no experience with automatic switching equipment.

The first automatic railway converter station, the schematic diagram of which is shown herewith, has recently been placed in operation by the Allgemeine Elektricitäts Gesellschaft at a substation of the Street Railway Company in Berlin. An interesting feature of the alternating-current self-starting converter is that no brush-lifting device is required as the starting of the set has been improved to such an extent that

brushes and commutator will not suffer from sparking even under the most severe conditions. The alternating-current source of control is taken from a potential transformer, and the automatic operation is accomplished by means of a drum-type master controller (9) driven through a clutch and gear reduction from a small three-phase motor. The contacts of the master controller energize in proper sequence the different operating contactors and relays. With the disconnecting switch and the automatic lock-out switch (4) closed, and the single-pole double-throw switch (2) closed in the right-hand (automatic) position, the circuits for automatic operation are set up and the converter is ready to start.

The time switch (1) closes and energizes the motor of the drum-type controller, which in turn causes the starting contactor (6) to close. The closing of the starting contactor energizes the closing mechanism of the main oil circuit breaker. The starting contactor and oil circuit breaker now being closed causes the converter to start on reduced voltage. If the polarity of the converter builds up in the wrong direction, a contactor (14) operated by a polarized motor relay (13) reverses the field, thus causing the converter to slip a pole. After the polarity has been checked, the field strength is adjusted to give unity power factor at average load and full voltage is applied by opening the starting contactor and closing of the running contactor (10), which connects the converter to the running taps of the transformer. The direct-current line breaker (17) now closes and the converter is connected to the trolley.

Protection is provided for cases that are of sufficiently serious nature to call for an immediate shut-down of the converter and to prevent it from starting or restarting until the trouble can be remedied by an inspector. This is accomplished by the lock-out switch (4), the contacts of which are normally closed. Any one of the following troubles will cause the station to lock out:

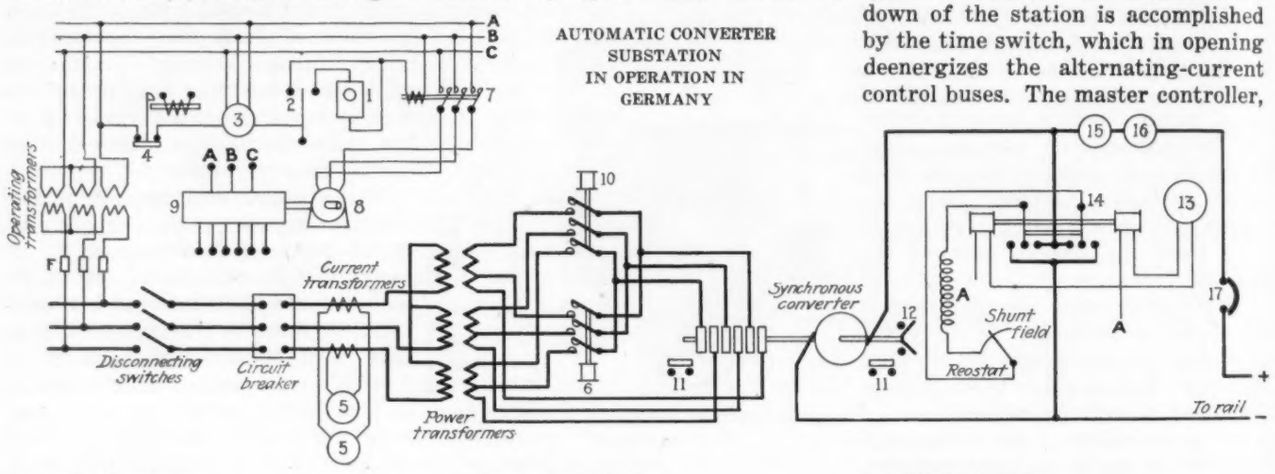
(a) Direct-current reverse current as indicated by reverse current relay (15). (b) Overspeed, as indicated by speed limit device on converter (12). (c) Severe alternating-current overload, as indicated by alternating-current overload relays (5). These overload relays are given a high setting, thus taking care only of very abnormal overloads such as short-circuit in the station, etc., or in case of failure of the direct-current overload relay. (d) Excessive bearing temperature, as indicated by bearing thermostats (11). The converter is locked out, if the bearing temperature rise above 100 deg. C. (212 deg. F.).

In case of trouble that can be automatically cleared, protection is provided so as to suspend normal operation temporarily during the emergency but to allow immediate resumption of service after the trouble has disappeared.

The emergencies calling for a temporary shut-down of the station are: (a) Continued direct-current overload; direct-current overload relay operates after time delay to shut down the station. (b) Alternating-current low voltage and phase unbalance. In case the alternating-current voltage drops to one-half of its normal value, the set is shut down by the operation of undervoltage relay (3). The same relay protects also against phase unbalance such as caused by an open phase. On the phases becoming balanced again, or return of alternating-current voltage to 75 per cent normal, the station will restart.

The entire switching operation is completed within one minute when the converter starts with the right polarity. If the field has to be reversed, the time is increased by one-quarter minute. The normal shut-down of the station is accomplished by the time switch, which in opening deenergizes the alternating-current control buses. The master controller, contactors and relays return in their starting position. By throwing the single-pole double-throw switch to the left-hand side (non-automatic position) time switch 1 can be cut out of circuit and the station will then start and run continuously, but with all automatic protective features. The converter can also be shut down manually, by throwing control switch 2 in the middle position. A centrally located annunciator is provided, which indicates the cause of trouble if the station locks out and thus enables the inspector to trace the faulty part.

AUTOMATIC CONVERTER SUBSTATION IN OPERATION IN GERMANY



1. Time clock
2. Single-pole double-throw switch
3. Undervoltage relay
4. Lock-out switch
5. Alternating-current overload relay
6. Starting contactor
7. Three-pole contactor
8. Alternating-current motor
9. Drum type master controller
10. Running contactor
11. Bearing thermostat
12. Overspeed device
13. Polarized relay
14. Field-reversing contactor
15. Direct-current reverse current relay
16. Direct-current overload relay
17. Direct-current automatic reclosing breaker with overload protection

Hastening Oil Filtering

BY W. G. SHURGAR

Superintendent of Power Station, Arkansas Central Power Company, Little Rock, Ark.

IN FILTERING transformer oil, it frequently happens that the procedure is considerably delayed by reason of the filter paper soon becoming clogged with solids and requiring replacement before proceed-

ing. To minimize this delay the Arkansas Central Power Company, Little Rock, inserts only two blotters in its five-blotter filter presses at the start. These remove a large percentage of the solids and absorb some moisture and can be more quickly replaced than five blotters. After removal they are replaced with the normal number of blotters, which is five in this case. Before starting the filter at all, however, any sediment on the transformer cores is washed off with a stream of oil.

Where there is considerable moisture in the oil, as determined by test, the Arkansas Central Power Company does not consider it safe to filter transformer oil by recirculation while the transformer is energized.

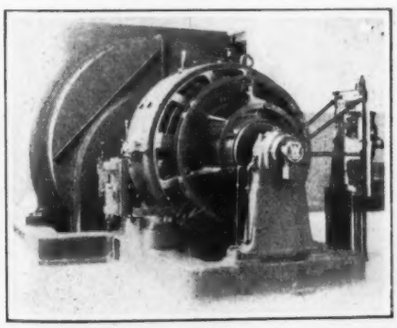
Synchronous Condenser Drives Railway Generator

BY JOHN BANKUS

Assistant Engineer, Portland Electric Power Company, Portland, Ore.

THE large amount of industrial load supplied by the Portland Electric Power Company from one of its outlying substations required in 1924 the installation of a 10,000-kva. synchronous condenser to take care of reactive current. A certain amount of 600-volt direct current is also required at this station for operation of the street railway system.

Advantage was taken of the opportunity of supplying the railway load



COMBINED SYNCHRONOUS CONDENSER AND RAILWAY GENERATOR TAKES ADVANTAGE OF DIVERSITY BETWEEN WATTLESS AND RAILWAY LOADS

by means of a 1,000-kw., 600-volt, direct-current generator, direct connected to the 10,000-kva. synchronous condenser. The condenser and the railway generator were purchased from the manufacturer as a combined unit, which is shown in the accompanying illustration. This unit has been in operation for nearly a year and has given complete satisfaction. The addition of the railway generator has not appreciably reduced the wattless capacity of the condenser and has resulted in a simple and economical method of supplying the railway load. The arrangement takes full advantage of diversity, since the railway peak loads occur in the morning and evening, whereas the maximum wattless requirements are between 8 a.m. and 4:30 p.m.

A Study of Power-Factor Correction

BY R. A. LANE

Design Engineer, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

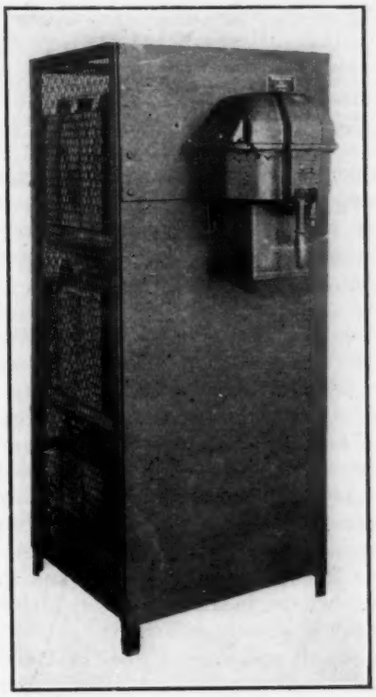
SOME interesting results were found in a study made of the power-factor corrective problem in the plant of the Howe Scale Company at Rutland, Vt. Power is furnished to the plant at 2,200 volts, three-phase, 60 cycles, and distributed through the factory at 220 volts. The central-station company meters on the 2,200-volt side of a bank of three 150-kva., 2,200/220-volt transformers connected in delta. The price paid for power is $0.0193 per kilowatt-hour with the following power-factor clause: Power factor below 70 per cent, four mills per kilowatt-hour penalty; between 70 and 80 per cent, 1 mill per kilowatt-hour penalty; no penalty or bonus from 80 to 95 per cent, and a one mill bonus for power factor above 95 per cent.

In addition to the purchased power, which amounts to about 163-kw. load, the company operates a power plant of its own, which normally has a connected load of approximately 60 kva. This load is arranged so that it may be put on the central-station company's circuit if desired.

The transformer bank was originally 600 kva. and the power factor about 48 per cent. Some load changes were made and the transformer bank changed to 450 kva. This gave sufficient transformer capacity not only for the normal load of 165 kw. at 63 per cent power factor but also to take care of the load ordinarily carried by the plant generator.

These changes in themselves had no immediate effect on the power bills, as the power factor was not increased to a point where the penalty was any less. However, considered in connection with the use of corrective equipment, the changes represented a saving of about 96 kva. in the amount of correction that had to be purchased.

In the determination of the proper type of corrective equipment to be used, there were three types considered; first, substitution of a synchronous motor for some of the



2,300-VOLT STATIC CONDENSER UNIT FOR POWER-FACTOR CORRECTION

present induction motors; second, group correction with static condensers on the 2,200-volt side of the transformer bank; third, correction with low-voltage static condensers at the motor terminals.

The use of the synchronous motor depends on the presence of a suitable load, such as a pump, blower or motor-generator set, which is on the line during all of the time the plant is in operation.

Of the two types of static condenser installations, the 2,200-volt group assembly has a lower first cost and costs less to install. It does not remove the wattless current from the transformers and low-voltage feeders. Conversely, the low-voltage condenser installation has a higher initial cost than the 2,200-volt assembly and costs more to install than the high-voltage outfit, but carries the benefit of correction to the limit by eliminating the wattless current in the transformer bank and feeder circuits.

Because, in this particular case, no suitable load for a synchronous motor was available, the choice was between the two methods of static condenser correction. If the additional saving by the use of the low-voltage

TABLE I—COMPARISON OF 22,00-VOLT AND 220-VOLT STATIC CONDENSERS

Final Power Factor, Per Cent	Corrective Kva. Required	2,200-Volt Condensers First Cost	*Annual Cost	†Saving	Per Cent Return	220-Volt Condensers First Cost	Annual Cost	Per Cent Return	‡Annual Saving	Added Annual Cost of 220-Volt Installation	Added Annual Saving Due to Use of 220-Volt Units Rather than 2,300-Volt Units
70	36	$1,150	$183	$1,165	101	$2,160	$330	62.4	$1,231	$247	$66
80	78	1,789	280	1,550	87	4,680	714	38.2	1,644	434	94
95 to 99	150	2,660	421	1,940	73	9,000	1,372	26.3	2,074	951	134

*Includes cost of condenser losses plus 15 per cent charge.
†Savings due to elimination of power-factor penalty.
‡Savings due to elimination of power-factor penalty and decrease in feeder losses.

condensers when capitalized was greater than their increase in cost over the 2,220-volt unit the correction should be made at the motor terminals.

In determining the economy of 220-volt direct-connected condensers it is assumed that the condensers can be distributed about on the motors so that only the same corrective kilovolt-amperes of low-voltage units need be installed as was used in the 2,200-volt group plan. This assumes that all the motors connected are operating all the time. This is never absolutely true and in cases where individual motor drive is used is greatly in error.

Annual operating time is 2,400 hours and calculations were based on a load of 162 kw. with an initial power-factor of 63 per cent. The feeder circuits are comparatively short and the copper large, so that distribution losses are small.

TABLE II—EFFECT OF STATIC CONDENSER ON MONTHLY POWER BILLS

Month	Kw.-Hr.	Power Factor	Total Bill
January, 1924	34,300	48	$856.13
February, 1924	47,000	61	1,096.70
March, 1924	47,500	48	1,008.25
April, 1924	42,400	48	990.32
Load changes made and transformer bank changed from 600 kva. to 450 kva.			
May, 1924	34,300	63	799.19
June, 1924	31,300	62	728.13
July, 1924	28,000	60	653.30
August, 1924	33,000	61	770.33
September, 1924	32,400	63	755.69
October, 1924	38,400	88	741.68
Condenser put on Oct. 20			
November, 1924	34,800	99	640.05
December, 1924	27,900	99	511.03
January, 1925	41,500	99	768.82
February, 1925	37,200	99	690.05
March, 1925	38,700	99	692.76
April, 1925	35,800	99	669.77

The question of how far the correction should be carried must also be considered. From the high penalty for power factor below 70 per cent it is apparent that the greatest gain will be made in correcting to that point. However, since a bonus is offered for power factor above 95 per cent, the cost of correcting to that point was considered.

The results show conclusively that the power factor should be corrected on the 2,200-volt side of the transformers and that enough correction should be used to bring the power factor to a value above 95 per cent.

From the tabulation in Table I it is seen that the 36-kva., 2,200-volt outfit required to increase the power factor to 70 per cent will pay for itself the first year. If an additional $1,510 is spent to obtain a 150-kva. outfit, the savings are increased $775 annually, or, more than 40 per cent of the additional investment, or a return of 73 per cent on the total investment of $2,660. If now we compare the additional return due to the use of 220-volt condensers with their additional cost, we find that in every case the added annual cost far exceeds the added annual return.

System Indicator Board Easily Constructed

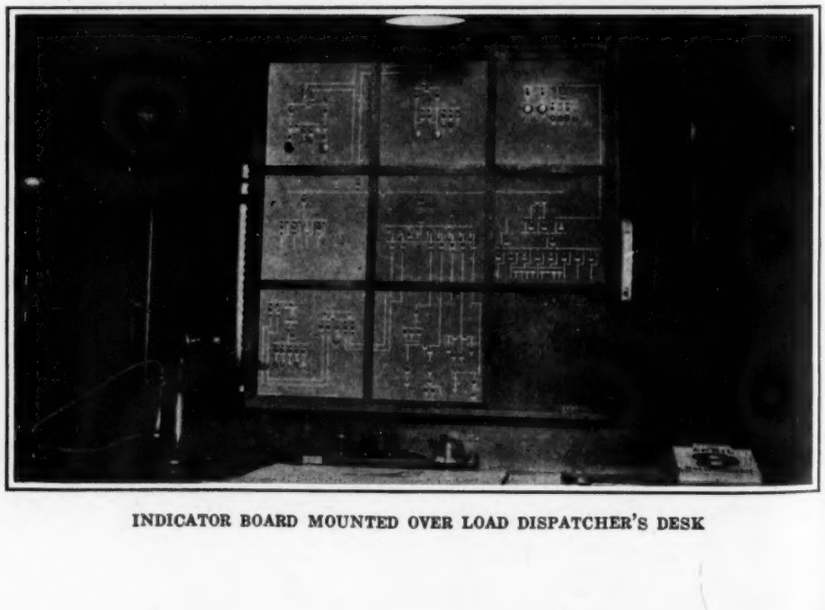
BY H. H. RUGG
Chief Load Dispatcher, Homestake Mining Company, Lead, S. D.

WHEN a power system consists of several generating stations and substations all under the control of one chief operator or load dispatcher, a pilot board of some kind is a great convenience and almost a necessity. It tells him at a glance the switching connections of the whole system, and also the generators and transformers that are in service. The large power companies have automatic pilot boards upon which small indicating lamps are operated directly, or through relays, from the switches which they represent, by the use of pilot wires. In some cases the lamps are connected to switches on the load dispatcher's desk and are operated by him as the switching operations are reported.

The cost of any type of board using separate lamps for each switch is high, and it is therefore necessary, except on the large systems, to employ some other means of indication.

A convenient and attractive pilot board has been constructed as shown in the accompanying illustration. Each panel represents a generating station or substation. The drawings were made on a larger scale and reduced photostat copies were made of them. The black and white drawings or even blue prints could be used, but the brown background of the photostats does not soil so easily and shows the red and green indicators more clearly. The prints are mounted on squares of ¼-in. battleship linoleum and are held in place by narrow strips of wood. The switches are represented by red and green glass-headed map tacks. Square tacks are used to represent the oil switches and smaller triangular ones for the disconnects. Round thumb tacks of different sizes represent the generators and exciters. The cork base will hold the tacks firmly even after being withdrawn and replaced many times.

Green tacks are used to represent switches that are open and red tacks for those that are closed. Light yellow tacks are used in connection with small tags when lines or machines are held out for repairs. The board is mounted over the load dispatcher's desk within easy reach.



INDICATOR BOARD MOUNTED OVER LOAD DISPATCHER'S DESK

Commercial Activities and Public Relations

Utility Advertising Men Extend Activities

IN ORDER to broaden the activities of the Public Utilities Advertising Association and afford a closer contact with the Associated Advertising Clubs of the World, a group of district organizations is now being established under the direction of W. P. Strandborg of the Portland (Ore.) Electric Power Company.

The plan, which was given its first practical test at the recent annual convention of the Pacific Coast Advertising Clubs Association at Seattle, is somewhat similar to the geographic organization of the National Electric Light Associantion. A general committee of men prominent in the advertising, publicity and public relations field has been selected to assist in developing the movement in each district, and it is expected that by the end of the year the public utility industry will be represented by permanent departmentals throughout the United States.

About a year ago the Pacific Coast Advertising Clubs Association created a public utilities departmental on the Pacific Coast. Earl V. Burke of the Pacific Railways Advertising Company, San Francisco, was selected as vice-chairman, and a program covering two days' sessions was staged at the Seattle convention in July.

The success of the efforts at Seattle gave impetus to the new movement and immediately after the convention plans were launched for giving tangible shape to the work by utility men in other sections of the country.

Among the special activities to be developed in connection with the formation of these district departmentals is an active speakers' bureau to arrange for the booking of public utility men for addresses before local advertising clubs and other business and civic organizations and to work as contact units with the international speakers' bureau of the Associated Advertising Clubs of the World.

The following advertising and public relations men will serve with Chairman Strandborg on the executive committee for the Pacific Coast district during the coming year: Vice-chairman, Earl V. Burke, Pacific Railways Advertising Company, San Francisco; members of committee: Norwood W. Brockett, director of public relations, Puget Sound Power & Light Company, Seattle, Wash.; Roy O. Hadley, Pacific Telephone & Telegraph Company, Seattle, Wash.; C. S. Reynolds, supervisor of public relations, Tacoma Railway & Power Company, Tacoma, Wash.; G. B. Foster, advertising and publicity manager, Washington Water Power Company, Spokane, Wash.; J. Charles Jordan, director of advertising, Pacific Gas & Electric Company, San Francisco, Cal.; D. L. Scott, advertising director, Los Angeles Gas & Electric Corporation, Los Angeles, Cal., and Richard E. Smith, advertising manager, Southern California Edison Company, Los Angeles, Cal.

Special Sale Increases Range Load

Minneapolis General Electric Company Has 5,000 Electric Range Customers—Cooking Demonstrations, Extensive Advertising and Easy Terms Used to Break Down Sales Resistance

BY H. A. DAHL
Merchandise Sales Manager, Minneapolis General Electric Company

MORE than five thousand electric ranges are connected to the lines of the Minneapolis General Electric Company and in building up this load among residential customers the company has found that carefully planned, educational-sales campaigns extending over a period of three weeks or a month are a very effective means of stimulating this business. The most recent campaign resulted in the sale of 107 ranges in twenty-five days, and its success is attributed largely to the fact that it was carried out on a definite, predetermined schedule.

In laying out the sales program the following elements were decided upon and arranged before the opening of the campaign: (1) Selection of new model range offered at special introductory terms, (2) choice of a campaign slogan, (3) setting salesmen's quotas, (4) arrangement for public cooking demonstrations, (5) advertising.

DETAILS OF PLAN

A new, full automatic range was selected and priced sufficiently low to permit featuring an introductory offer of $5 down and $1.88 per week. "A Cook for $1.50 a Week" was adopted as a slogan to be featured in window displays, advertising and letters to prospects. Sales quotas of twenty ranges per salesman were established and prizes were offered for those who reached or exceeded their quotas.

Now I can afford one!
The Clock that Cooks
Easy to Use
Come in the Display Rooms at 132 West Superior Street today
THE MINNEAPOLIS GENERAL ELECTRIC CO.
Division of Northern States Power Co.
MORE THAN 45,000 SHAREHOLDERS
15 So. 9th St.

TYPE OF NEWSPAPER ADVERTISING USED

During the entire period of the campaign a full window display of a model electric kitchen was maintained, with the company's domestic science expert in charge. Housewives from all sections of the city were invited to bring ingredients of cakes to be baked according to their favorite recipe. They came in large numbers and these demonstrations served as convincing proof that the electric range was entirely practicable with less than half the labor or

trouble experienced with fuel-heated equipment. In addition to the demonstrations held in the main store, twelve others were conducted in adjacent rural territory. The attendance at one of these demonstrations that was held in a rural school house is shown below.

A generous amount of advertising was used in connection with the campaign. A broadside and letter

YOU ARE CORDIALLY INVITED TO ATTEND
THE BIG ELECTRICAL EXPOSITION
AND LECTURE ON
"ELECTRICITY AND ITS USES"
BY J. O. HOEFFLER, MANSFIELD, OHIO
BROOKSIDE SCHOOL - AURORA AVE.
ST. LOUIS PARK, MINN.
FRIDAY, AUGUST 31st
LECTURE AT 7:30 P. M. SHARP
BUFFET LUNCHEON SERVED AFTER LECTURE
UNDER THE AUSPICES OF
THE MINNEAPOLIS GENERAL ELECTRIC CO.

INVITATION TO ELECTRIC RANGE DEMONSTRATION

calling attention to the new range, the attractive terms of purchase and the limited period of the special offer were sent to every prospect. Bill inclosures were mailed to 75,000 electric customers and proved effective in uncovering new prospects at lower cost than canvassing, and the follow-ups of these prospects resulted in a number of the sales. Newspaper advertising included six teaser ads, featuring the slogan "A Cook for $1.50 a Week" and aroused interest prior to the opening of the campaign. Display ads calling attention to the new model range and easy terms were run in two local newspapers, reaching a majority of the homes in the city.

At the close of the campaign six salesmen had sold a total of 107 ranges, three of them averaging one range sale a day. The Minneapolis General Electric Company's cooking rate is three cents per kilowatt-hour and this additional cooking load will bring approximately $6,400 increased yearly revenue.

ELECTRIC EQUIPMENT AT SHAFTS—KANSAS CITY, MO., WATER-WORKS PROJECT

Location	Turkey Creek 3–75 Kva. Trans. 13,200-Volt Primary	12th and Sa. Fe 3–75 Kva. Trans. 4,000-Volt Primary	1st and Wyandotte 3–75 Kva. Trans. 13,200-Volt Primary	No. K. C. 3–75 Kva. Trans. 13,200-Volt Primary
Equipment	Motors	Motors	Motors	Motors
Hoist	One 60-hp	One 60-hp.	Two 100-hp.	One 100-hp.
Compressor	One 75-hp.	One 100-hp.	One 100-hp.	One 100-hp.
Mixer	One 20-hp.	One 10-hp.	One 10-hp.	One 10-hp.
Conveyor	One 10-hp.	One 7½-hp.	One 7½-hp.	One 7½-hp.
Blower	One 20-hp.	One 20-hp.	One 125-hp.*	One 125-hp.*
Pump	Future	One 20-hp.	Two 30-hp.*	Two 30-hp.*
Motor-generator	.....	.....	One 15-hp.*	One 15-hp.*
Sawmill	.....	.....	One 5-hp.	.....
Locomotive	.....	.....	One 4-ton (future)	One 4-ton (future)
Lights	4-kw.	4-kw.	7-kw.	7-kw.

NOTE: The compressors are rated at 470 cu.ft. per minute at 110 lb. per square inch.
*The two 30-hp. pumps will soon be replaced by the motor-generator set and blower.

Water-Works Construction Offers 1,400-Hp. Load

BY B. J. GEORGE
Industrial Engineer Kansas City Power & Light Company, Kansas City, Mo.

THE Kansas City Power & Light Company recently closed power contracts with Smith Brothers, Inc., of Dallas, Tex., contractors, for 1,400 hp. in electric service to be used in the construction of the concrete tunnels that are a part of the $11,000,000 water-works project for Kansas City, Mo. The work involves the construction of 26,000 ft. of concrete tunnels, making necessary the supply of power at four different locations. Energy at three stations will be supplied at 13,200 volts, and the fourth service will be connected to the 4,000-volt distribution lines of the company. The contractor will own and maintain the transforming equipment and purchase service at the primary voltage. The estimated loads and transformer installations are given in the accompanying table. Equipment to be served from central-station lines includes hoists, compressors, ventilating blowers, water pump, concrete mixers, unloaders, battery-charging sets and lighting equipment as shown in the table. Electric locomotives are proposed for use in the tunnels.

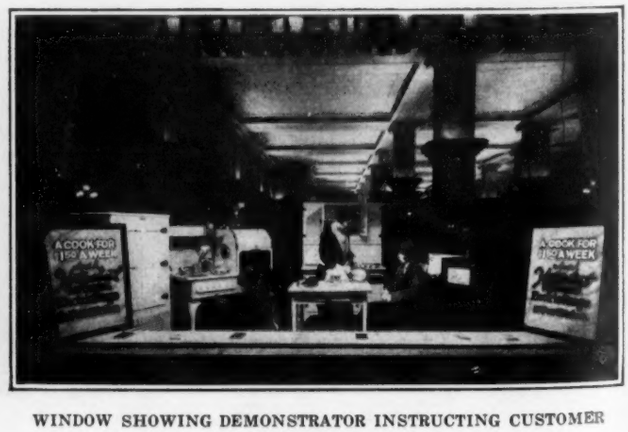
An interesting feature of the tunnel construction is the fact that electricity will be used throughout the job, the one exception being gasoline-engine-driven auxiliary air compressors to provide air for the caissons in emergency.

The primary energy contracts are demand and energy rates, being based on a minimum demand of 75 kw. At this early stage of the construction of the shafts, no reliable figures as to demands and consumption are available. At one location, the installation has shown a measured half-hour demand of 57 kw. and a load factor of from 30 per cent to 50 per cent. The chief characteristics of the rates are as follows:

Off-Peak Monthly Demand Charge	13,200-Volt Rate	4,000-Volt Rate
First 200 kw. of demand	$1.25	$1.75
Next 200 kw. of demand	1.00	1.25
All over 400 kw. of demand	0.75	0.75
On-Peak Monthly Demand Charge		
First 200 kw. of demand	0.75	0.75
All over 200 kw. of demand	0.50	0.50

Total demand charge is sum of the off-peak and on-peak demand charges and is the minimum monthly bill.

RANGE DEMONSTRATION CONDUCTED IN RURAL DISTRICT



WINDOW SHOWING DEMONSTRATOR INSTRUCTING CUSTOMER IN USE OF ELECTRIC RANGE

Monthly Energy Charge	13,200-Volt Rate	4,000-Volt Rate
First 120 hours use of maximum demand	$0.0115	$0.0125
Next 120 hours use of maximum demand	0.0095	0.0100
All over 240 hours use of maximum demand	0.0075	0.0080

The peak period is designated as from 4 p.m. to 7 p.m. during the months of November, December, January and February.

The demand is the maximum half-hour demand as shown by recording maximum demand meters, the maximum demand as reached in any month being used for the billing demand twelve consecutive months unless a higher demand is reached.

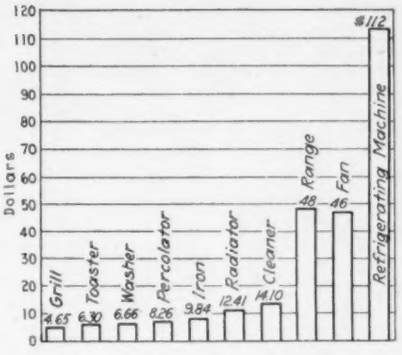
The rates also provide a fuel rider based on coal at $4 per ton, delivered.

The Kansas City Power & Light Company in addition to furnishing power to Smith Brothers, Inc., also furnishes power to other contractors engaged in building the other parts of the new water-works. When completed, the new low-lift pumping station and the new high-lift pumping station will be electrically driven throughout, the power to be purchased from the Kansas City Power & Light Company.

The construction of the tunnel project is under the direct supervision of C. S. Foreman, formerly chief engineer of the city's waterworks department and now resident engineer for Smith Brothers, Inc., and will require thirty months for completion. The completed system will provide the city with 100,000,000 gal. of filtered water daily. The plant was designed and its installation is being supervised by Fuller & Maitland, consulting engineers, Kansas City.

Domestic Refrigeration as a Load Builder

ANALYZING the electric refrigerator as a load builder before the New London convention of the New England Division N. E. L. A., C. Ernest Greenwood of Boston pre-



AVERAGE ANNUAL INCOME AND INCOME PER KILOWATT OF DEMAND FOR TEN MOST POPULAR APPLIANCES

sented the accompanying charts showing the increase in energy sold and billed in typical residential installations. The energy requirements rise immediately to attractive totals when this service gets under way, lifting the small customer out of the "dead wood" class and putting the larger user on a higher plane of utilization. Four leading manufacturers already have 65,000 machines in service and the outlook for next year it is expected will easily be double this number.

A downward trend in servicing calls to one or two per year was a notable feature of Mr. Greenwood's comment on this phase of the domestic electric refrigerator situation.

ANNUAL REVENUE FROM TEN BEST SELLING APPLIANCES

Average Annual Income		Income per Kw. of Demand	
Washer	$2.00	Grill (600 watts)	$4.65
Fan	2.30	Toaster (500 watts)	6.30
Cleaner	2.35	Washer (300 watts)	6.66
Grill	2.85	Percolator (475 watts)	8.26
Toaster	3.15	Iron (575 watts)	9.84
Percolator	4.03	Spot heater (650 watts)	12.41
Iron	5.62	Cleaner (175 watts)	14.10
Spot heater	8.06	Fan (50 watts)	46.00
Refrigerating unit	28.08	Range (7,000 watts)	48.00
Range	48.75	Refrigerating unit (250 watts)	112.00

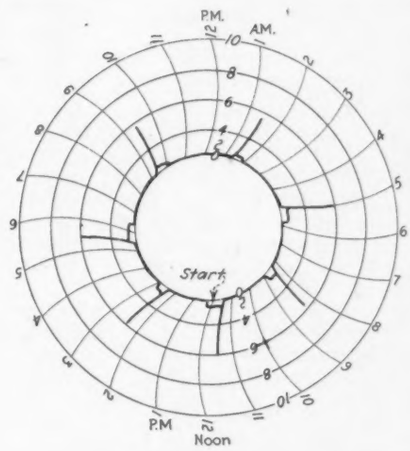


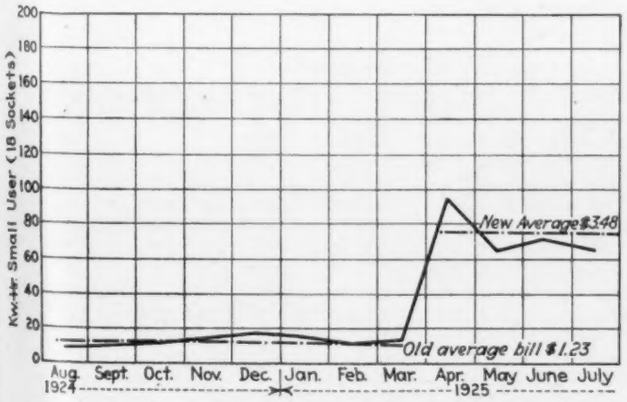
CHART SHOWING ACCURATE REGULATION OF REFRIGERATOR DEMAND AND STEADINESS OF OPERATION OF UNIT. MOTOR OPERATED ABOUT 24 PER CENT OF THE TWENTY-FOUR-HOUR PERIOD

Commercial Lighting Campaign for Spokane

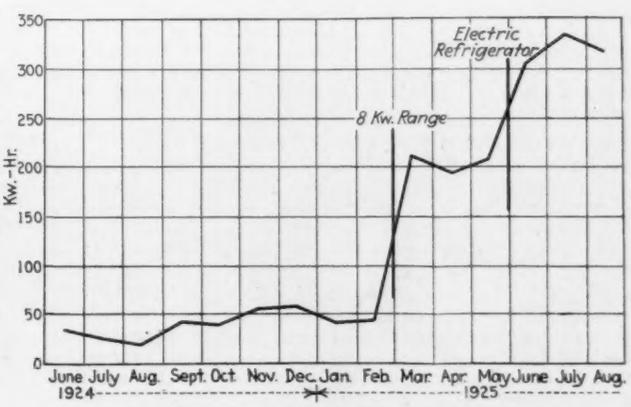
A THIRTY-DAY commercial lighting campaign was started late in September by the Washington Water Power Company, during which it is expected to sell 1,000 store lighting units. The entire sales force of the commercial department will be engaged in making a thorough canvass of the business district of the city, and it is expected to raise considerably the standard of illumination of business houses in Spokane.

The unit chosen for the campaign is a 16-in. fixture with glassware similar to the 9-in. daylight kitchen unit. Lamps to be used in the unit will be of the 300-watt and 500-watt sizes.

The basis of sale will be $12 per unit installed, with the privilege of term payments.



EFFECT OF REFRIGERATOR PURCHASE ON SERVICE BILL OF CUSTOMER WITH EIGHTEEN SOCKETS INSTALLED



HOW PURCHASE OF ELECTRIC RANGE AND REFRIGERATOR AFFECTS ENERGY CONSUMPTION

As shown in the illustration at the left the bill rose from $1.23 to $3.48 per month; and in another home with forty sockets the increase was from $5.51 to $8.84.

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

Increase in Thermal Efficiency Due to Resuperheating in Steam Turbines.—W. E. BLOWNEY and G. B. WARREN.—This is a reprint of the article under the same title which was abstracted in the Digest for August 15, 1925.—*General Electric Review*, September, 1925.

Synthetic Oil and Caloric Power Plants.—ZUR NEDDEN.—While it has been known to chemists for some time that a certain process of coal distillation may yield a variety of synthetic oils, a German company has now succeeded in exploiting such a process on a large and practical scale. This method, developed by Dr. Bergius, utilizes a mixture of low-grade Ruhr coals, containing 6 per cent ashes, which is heated in an autoclave at about 450 deg. C. and at 150 atmospheres pressure, while hydrogen gas and iron oxide are added. One ton of coal, with 50 kg. of hydrogen and 50 kg. of iron oxide, will yield 525 kg. of oil, of which 150 kg. is refined motor oil, 200 kg. is oil suitable for Diesel engines, 60 kg. is a high-grade lubricating oil, 80 kg. is fuel oil and 33 kg. represents distillation losses. The required hydrogen is obtained as a by-product from the process itself. A combination of a steam power plant with a Bergius synthetic-oil plant has much to recommend it. Aside from providing its own supply of lubricating, transformer and switch oils, the power required would give a steady load to the plant, consuming about 7,500,000 kw.-hr. for every 20,000 tons of coal; it would furnish oil for its Diesel peak-load generator sets, and it would find a ready market for its lighter oils.—*Elektrotechnische Zeitscrift*, September 10, 1925.

Generation, Control, Switching and Protection

Dimensioning of Phase Splitters.—B. GERSTMAN.—When it is desired to change a single-phase system into a polyphase system without using a motor-generator set, a split-phase converter will accomplish the task. Such machines find particular use on traction systems. The present theoretical paper investigates the advisability of this phase-splitting system with the three most employed types of machines. The author finds that if the converter is only used to change phases, its capacity, must be equal to the total output of the locomotive. If, besides phase change, the machine serves also for voltage transformation, the converter must deliver two and one-half times the locomotive output. With the special type of converter, as developed by Kandó, where the direct-current excitation is regulated according to the prevailing load so as to always maintain unity power factor, it will be necessary to give the machine a capacity of nearly three times the locomotive output. Compared with straight single-phase drive, requiring only a stationary transformer and a series motor, the economy of a phase-splitting system, with its greater complexity and much larger weight, appears questionable.—*Elektrotechnik und Maschinenbau*, August 30, 1925.

Two French Superpower Stations, Comines and Gennevilliers.—JOHN B. C. KERSHAW.—The station first named, originally of 75,000 kw. installed capacity has been increased to 100,000 kw., which makes it, aside from Gennevilliers, the largest steam-electric power plant in France. It serves the textile and manufacturing district in the vicinity of Lille in the north of France. Gennevilliers supplies power to the Paris district and when completed (in 1926) will be one of the largest steam-power stations in Europe, with an installation of 320,000 kw. It is noteworthy for the many devices and details of construction adopted for deriving the highest attainable thermal efficiency, the heat from the top of the boiler house, from the generators and from the oil coolers all being utilized. These stations are described with data, load curves and maps of the territories served.—*World Power*, September, 1925.

Transmission, Substations and Distribution

Mechanical Characteristics of Transmission Lines.—VII—Transmission Towers.—L. E. IMLAY.—Previous parts of this long serial have been noted in the Digest. The one now published outlines the procedure in tower design and calls attention to the fundamental considerations involved, while, however, leaving the actual computation of stresses and selection of members as problems in statics and in structural design. Construction data for a number of typical towers are given.—*Electric Journal*, August, 1925.

Rural Electrification.—ROBERT H. ROGERS.—This illustrated general article outlines the present situation and gives a long list of electric power applications possible on the farm.—*General Electric Review*, September, 1925.

Transformer Problems.—M. VIDMAR.—In a recent revision of the German V.D.E. rules testing voltages and testing methods for all types of transformers have been made much more severe. It has been ruled that machines up to 10 kv. shall be tested with three and a quarter times normal voltage, and above 10 kv. with one and three-quarters times plus 15,000 volts. In addition, all transformers must pass an impulse test with steep wave-front voltage. The writer, who is one of the foremost transformer experts of Europe, is of the opinion that, while the designer should have no particular difficulty in meeting these rigorous requirements, it appears questionable whether such drastic rules are really necessary. In the face of all the facts that are presented in the article, the author recommends that more attention be paid to the technical side of transformer problems.—*Elektrotechnik und Maschinenbau*, Sept. 13, 1925.

Units, Measurements and Instruments

Calculation of the Mutual Inductance of Coaxial Cylindrical Coils of Small Radial Depth.—F. B. VOGDES.—Based on the use of a set of curves for mutual inductance between coaxial circles, constructed according to a method described in a recent publication of the Bureau of Standards, and the application thereto of a suitable templet representing the coils, a rapid process of summation for total mutual inductance is described, the coils being divided into a number of parts.—*Proceedings I. R. E.*, August, 1925.

Oil-Testing Method.—V. d. HEYDEN and TYKE—Considering the fact that present methods of judging the suitability of oils for transformers, switches and turbines do not determine exactly the tendency of the oil to form sludge, a large German company suggests a new and quite simple test and asks for comments on it. The essential part of the new method is that oxygen shall be blown for seventy hours through the oil sample, heated to 120 deg. C. If sludge is noticeable, the oil is unsuitable. If it remains without a deposit, the tar figure of the oil is determined, whereupon the sample is treated with standard benzine for twelve hours. No sludging should occur if the oil is to be used in transformers or switches.—*Elektrotechnische Zeitschrift*, August 20, 1925.

Calculating the Repulsion of Coaxial Coils.—H. B. DWIGHT.—A formula has been developed that is applicable to such problems as the computation of the force between air-cored reactance coils at times of short circuit. It consists of a summation of several series, rapidly convergent for coils whose length is equal to or greater than their diameter, and includes terms involving the radial thickness.—*Electric Journal*, August, 1925.

Illumination

Year's Progress in Illumination.—The annual report of the society's committee on progress consists essentially of a 120-page review of recent developments in regards to light sources, their applications and measurement, and of related physical and physiological studies. The usefulness of the report as a biography is indicated by the large number of citations, namely 540.—*Transactions of the I. E. S.*, September, 1925.

Eye Fatigue and Its Relation to Light and Work.—PERCY W. COBB and FRANK K. MOSS.—In connection with the tendency to use higher levels of illumination in industrial lighting the question of possible "eye fatigue" has received attention. An attempt has been made to determine the effect, if any, of intensity of illumination upon the eye by controlled laboratory experiments. The subject was obliged to follow by eye the movement of a certain one of a number of identical spots on a rotating disk and to indicate its arrival in a specified position by signal. A counting device registered the numbers of total and of correct signals. The test was continued for thirty minutes, so that no doubt existed in the subject's

mind that fatigue was present. Two levels of illumination were used, 5 lumens and 100 lumens. Objectively the presence of fatigue was determined by a test for the balance of the eye muscles. It was found that, although the particular task could be performed as well under the lower level of illumination, the higher intensity was in no way harmful or tiring to the eyes of the worker.—*Journal Franklin Institute*, August, 1925.

Motors and Control

Early Textile Electrifications in the South.—B. S. HAVENS.—An illustrated description is given of several pioneer installations, dating back to 1894 and 1895, involving the use of both induction and synchronous motors. For one mill an installation of two 500-kw., 108-r.p.m., three-phase generators directly connected to waterwheels was made in 1894, with an 800-ft. transmission. Fourteen 65-hp. induction motors were installed. The generators and motors are still in service after more than thirty years' operation.—*General Electric Review*, August, 1925.

Large Rectifier Plant in Rolling Mill.—W. ZIMMERMANN.—Except for battery charging and the supply of light and street-railway service, mercury-arc rectifiers have had so far a rather limited field. The demand for an absolutely reliable source of direct current—one which is subjected at the same time to wide load fluctuation, overloads and not infrequent short circuits—kept, for example, rolling mill operators from using this new type of rectifiers in their plants. This conservatism was broken for the first time when a large German rolling mill installed a capacity of 1,500 kw. in eight mercury-arc rectifiers to furnish 500 volts for power and 250 volts for light. The present article describes at length the installed equipment and gives operating data gathered during the first year of service. It appears that after a few minor mechanical and electrical troubles had been successfully remedied the plant gave perfect satisfaction even under most adverse conditions, working in parallel with a number of blast-furnace gas-engine generators.—*Elektrotechnische Zeitschrift*, August 20, 1925.

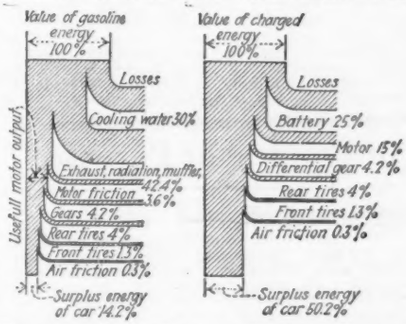
Traction

Recuperative Braking on Direct-Current Traction.—E. HELDE.—In this very detailed twenty-page article the writer gives a practical review of all those recuperative braking systems which have given satisfactory results on direct-current traction systems of French and foreign origin. The very considerable amount of reclaimed current makes it, under present economic conditions in France, a national necessity to pay great attention to current recuperation on the large and growing number of electrified direct-current railroads. The mountainous character of southern and eastern France is an additional impetus to the extended use of such braking systems. Without committing himself to any preference for any one of the explained systems, the article presents an impartial and valuable critical study of the subject, well illustrated by thirty-seven diagrams of the different motor connections.—*Revue Générale de l'Electricité*, August 15 and 22, 1925.

Illinois Central Electrification Uses Catenary System.—Overhead construction for the Chicago electrification is described in this article. The catenary system over each track will in itself provide the required current-carrying capacity, without additional feeders. Double contact wires are to be used. The design assumes an average voltage drop in normal rush-hour service of 12 per cent, with an all-day average estimated at 3 per cent. Information includes data on mechanical and electrical features, covering the contact system, alternating-current distribution and rails.—*Electric Railway Journal*, September 5, 1925.

Heat Applications and Material Handling

Economies of Electric Trucks.—H. S. MEYER.—Compared with the rapid and successful development of gasoline-driven cars, electrically propelled street vehicles are technically far behind, in spite of the fact that electric drive is much simpler and has a number of decided advantages. In an attempt to compete with the gas-driven car the earlier electric cars were made with high and uneconomical speeds. The former speeds of 18 miles to 25 miles per hour have today been reduced to 7 miles to 12 miles per hour. In an endeavor to avoid differential drive two motors were used on electric cars. It was found out, however, that it is impossible to insure equal load division between the two motors, overload and premature failure of one of them being the result. The greatest handicap of electric cars is the insufficiently developed storage battery. Even the most modern lead-plate cell represents too high a weight and has too short a life. One-third of the useful load of a modern truck is the weight of the battery. The Edison cell was no relief in that respect. The reason why in spite of these conditions the number of electric trucks is steadily increasing is their higher efficiency and economy and much greater simplicity. While the gasoline-driven car operates with only 14 per cent efficiency, the electric car reaches readily 50 per cent. The segregated losses of both cars are shown graphically in the diagram reproduced. At the present price of gasoline—40 cents per gallon (German price)—electric truck operation costs the same as with an energy rate of 5 cents per kilowatt-hour. But energy can frequently be bought for much less than that, either as night energy or from hydro-electric plants, in which case electric car operation is correspondingly cheaper. Differences up to 30 per cent in favor of the electric car are not uncommon. Charging fleets of storage batteries during the night valley is a highly desirable central-station load and should be an impetus to the wider use of electric trucks within large cities. At present there are only 3,000 electric trucks in operation in Germany against some 5,700 gasoline trucks.—*Electrotechnische Zeitschrift*, August 13, 1925.



PERFORMANCE OF GAS AND ELECTRIC TRUCKS

At Left—Distribution of energy in gasoline trucks.

At Right—Distribution of energy in electric trucks.

Electrophysics, Electrochemistry and Batteries

Notes on the Plating of Chromium on Steel.—A long abstract is given of a paper by George M. Enos, presented at the annual meeting of the American Electrochemical Society at Chattanooga.—*Engineer* (*England*), August 21, 1925.

Principles and Operating Conditions of Chromium Plating.—H. E. HARING.—In order to reduce the wear on plates for "plate" printing, such as is used at the Bureau of Engraving and Printing, a process has been developed for applying extremely hard chromium metal electrolytically. In the present article the general principles of chromium deposition are discussed. It is extremely important to have the three factors—acidity, temperature and current density—carefully adjusted.—*Chemical and Metallurgical Engineering*, August, 1925.

Telegraphy, Telephony, Radio and Signals

A 200-Kw. Triode Transmitter.—BALTH. VAN DER POL AND K. POSTHUMUS.—Measurements have been made with triodes generating high-frequency currents in a four-tube 200-kw. experimental station in the Philips lamp works at Eindhoven, Holland, in which, however, the usual radiating antenna is replaced by an artificial aërial of known constants. These large tubes became possible by making the anode the lower part of the containing vessel and sealing the glass bulb to it with a vacuum-tight joint. The operation is described in detail.—*Electrician* (*England*), August 21, 1925.

Development of Valves for Wireless.—B. S. GOSSLING and M. THOMPSON.—This is the third and concluding part of the serial. It contains first an analysis of the energy losses, quantitative information on influences that affect the working life and other consideration having to do with the design of valves, especially those of large size for the handling of considerable power. The cathode evaporation, and hence its life, varies very rapidly with temperature, so that an increase of only 5 per cent in filament voltage reduces the life by half. These and other relations are shown. The remainder of the paper takes up details of the present-day design of receiving valves.—*World Power*, September, 1925.

Scientific & Industrial Research

[When investigations which have been completed are, in the opinion of the editors, of wide enough interest to the field we serve, details thereof will be presented in other parts of this paper. Contemplated research or that which appears to have limited appeal will be only briefly reported in this section, but details may be had by communicating with the investigator or institution named in the report. Readers are referred to the department "Digest of Electrical Literature" for investigations reported in other journals. The news and engineering sections should also be followed for research reported before technical societies.]

Research Completed

Armature Windings, Direct-Current, Equalized

An armature winding consisting of a combination of lap and wave coils has been developed for large multipolar direct-current machines. Wave coils serve as equipotential connections and prevent unequal distribution of branch currents with unbalanced magnetic circuits. At the same time, the conductors of wave coils are active conductors in which voltages are induced and which constitute additional parallel branches of the total winding. For details see *Iron and Steel Engineer*, September, 1925, page 345.—*W. H. Powell and G. M. Albrecht, Milwaukee, Wis.*

Boilers, Fireclay Brick for

Representative samples were subjected to the following tests: (1) An endurance test (in which brick were held at 1,450 deg. C. for seventy-two hours, both with and without load); (2) a reheating test (in which the change in volume and porosity was determined after the brick had been held at 1,400 deg. C. for five hours); (3) a quenching test; (4) the standard A. S. T. M. load test, and modifications of this test; (5) the softening points were determined by the cone method. Brick of each brand were analyzed chemically and several examined petrographically. As a result of the laboratory work it was found that a close relation existed between data obtained in the endurance, reheating, quenching and softening point tests, and that these depended to a remarkable extent on the chemical composition.—*R. F. Geller, Bureau of Standards, Washington, D. C.*

Colors, Fading of, by Daylight and Tungsten Lamp

An investigation has been made to determine the relative rates of fading of colored materials by daylight and artificial light. The effects of various factors such as illumination intensity, spectral character of the radiation, temperature, humidity, etc., have been studied. Colored silk ribbons were used for the tests. The average results of tests on twenty-three ribbons show that exposure to sunlight and skylight at 3,900 foot-candles for eleven hours, or to skylight alone at 450 foot-candles for forty hours, will cause as much fading as exposure to 500 foot-candles from tungsten lamps for one-hundred hours. Also, that approximately equal degrees of fading will result from exposures to tungsten-filament radiation for 100 foot-candle-hours, skylight for 34 foot-candle-hours, or to sunlight and skylight combined for 77-foot-candle-hours. —*M. Luckiesh and A. H. Taylor, Nela Park, Cleveland, Ohio.*

Lamps, Vibration Tests on

In addition to the regular tests of lamps, a series of tests was conducted to determine the relative merits of ordinary and mill-type lamps under severe vibration. For this purpose a machine was constructed that subjected the lamps to rapid vibration similar to that of railway service, only very much more severe. The lamps subjected to the tests were burned for 200-hour periods on the life-test racks, after which they received the vibration tests. The number of lamps failing under vibration after each burning period gave an indication of the ruggedness of construction. This test established conclusively that the mill-type lamps are far superior to the ordinary type, of corresponding size in their ability to withstand vibration. Vibrations were also applied to coach-lighting lamps for one of the trans-continental railway systems.—*Hydro-Electric Power Commission of Ontario, Toronto, Canada.*

Stroboscope, Vibrating-String Type

A stretched string is provided near its center with an aluminum vane which has a slit in it. This slit is opposite a similar slit in a stationary vane. When the string vibrates the two slits are on the same line of vision during a small part of each oscillation only. A rapidly revolving object can thus be observed stroboscopically, at a much lower apparent velocity, and its irregularity of motion studied. For details see *Recherches et Inventions*, Aug. 15, 1925, page 708.

Tungsten, Thermal Expansion

An investigation has been made on the thermal expansion of tungsten (99.98 per cent) over various temperature ranges from about —100 to +500 deg. C. The expansion is given by the following empirical equation:

$L_t = L_0 [1 + (4.28t + 0.00058t^2)10^{-6}]$,

where L_t represents the length of the metal at any temperature t between —105 and +502 deg. C., and L_0 = length at 0 deg. C.—*Bureau of Standards, Washington, D. C.*

X-Ray Diffraction Apparatus

This device provides a good method for qualitative chemical analysis of solids, for accurate determination of crystal structures and for supplementing ordinary metallographic methods. The apparatus includes a scale by which the diffraction pattern may be easily read in Angstrom units to one part in a thousand. The diffraction pattern of a substance thus quantitatively measured is as characteristic of that substance as its density, solubility, melting point or ability to form chemical compounds.—*General Electric Company, Schenectady, N. Y.*

In Progress or Purposed

Annealing, Bright

For bright annealing strip steel an electric furnace equipment was recently installed as a test unit to determine the advisability of commercial bright annealing unstripped steel. This furnace is now running on intermittent commercial production, and the present operations shows attractive economies in power consumption.—*Stanley Works, New Britain, Conn.*

Combustion Air, Heating of, with Waste Gases

Recent tests and developments in the preheating of combustion air by waste gases have shown that in the future the installation of this type of equipment should be considered in the study of the heat balance of a power station.

The limited experience gained to date with the use of preheated combustion air has shown that material improvement in boiler-plant efficiency can be accomplished with such installations without material increase in the maintenance of stokers, refractories, etc.—*National Electric Light Association, New York, N. Y.*

Insulating Materials, Deterioration of

The subject of deterioration of sheet insulating materials is an exceedingly important one. A committee is endeavoring to develop a standard method for determining the rate of deterioration, and various laboratories have accepted investigation consignments under this program, the first part of which is the collection of available data on the effect of various deteriorating agencies on various kinds of sheet insulating materials. These deteriorating agencies will include ozone, oxygen, heat, electrical tension, moisture, acidity and catalytic agents, oils in compounds, chemical agents, light and mechanical stresses.—*American Society for Testing Materials, Philadelphia, Pa.*

Oil, Petroleum, Neutralization Numer of

When two similar metallic electrodes are immersed in solutions having the same common ion in different proportions and the two solutions are joined by a non-metallic conductor (salt bridge), an electromotive force is set up which varies with the difference in concentration in the two solutions. This may be used to measure the concentration difference, by titrating one of the solutions until its evolved ion concentration is the same as that in the other solution, the result of which the electromotive force reaches zero.—*Max Hecht, American Society for Testing Materials, Philadelphia, Pa.*

Reflectors, Chromium-Plated

Floodlighting and automobile headlighting require a reflecting material of sufficient surface hardness to be readily cleaned without scratching, which will maintain a high coefficient of reflection at elevated temperatures throughout the life. The material must not be so brittle as to be readily broken. Experiments and life tests show that chromium-plated reflectors meet these requirements.—*R. J. Piersol, East Pittsburgh, Pa.*

Steel, High-Speed, Tool

An investigation is being conducted on the effect of nickel, cobalt, tantalum and molybdenum in high-speed steels. The results will be published in the *Transactions* of the American Society for Testing Materials.—*Bureau of Standards, Washington, D. C.*

Suggestions for Research

Arc, Electric, with Cooled Revolving Cathode

Some experiments seem to indicate that a direct-current arc is more difficult to maintain when the cathode is artificially cooled. A rapid rotation of the cathode has partly the same effect. These ideas may be useful in further improvements of large circuit breakers.

Illumination, Secondary, the Law of

The problem of the illumination produced on any arbitrary surface by light emitted from another surface obeying Lambert's cosine law has been worked out by the application of Stokers' law (*Zeitschrift der Physik*, Sept. 24, 1924, page 102). It is shown there that the illumination vector is a function of another vector for which the name "vector-potential of illumination," is proposed. It is desired to apply this theory to practical problems of indirect illumination.

Motors, Alternating-Current Commutator, Armature Windings for

In M. Schenkel's "Die Kommutatormaschinen" (Berlin, 1924, page 132) the following statement is made: "At standstill the transformer voltage under the brushes cannot be compensated for. However, there are types of windings with independent circuits which can be so arranged that the short-circuit voltage is also taken up by a large number of armature conductors. . . . So far it has not been possible with such an arrangement to avoid considerable sparking, but there are already indications in the literature that with a suitable winding the problem is solvable." Literature references are given on page 251 to 254.

Oil Switches, Physical Research on

Points on which further knowledge is required are the length of the arc where high power or high voltage is concerned, definite knowledge of the effect of frequency, the effect of high pressure where high power is concerned, quantitative information as to the conditions under which hot ignitable gases are expelled from the oil, the temperature and vapor content of the gas bubbles—the time that the "oil piston" above the gas bubble is maintained—and the power developed and the volume of gas produced when breaking circuit.—*G. Brühlman, Bulletin Schweizerischer Elektrotechnischer Verein*, Vol. 17, page 81, 1925.

Spark Plug Shunted by Condenser

A small condenser across the gap of a spark plug, used for ignition in internal-combustion engines, should theoretically improve its performance in that a larger quantity of electricity would be available for discharge. A spark plug based on this principle was constructed by G. Mabloux (*Recherches et Inventions*, 1925, July 15, page 652), with a condenser and a small self-inductance incorporated in the plug itself. Further studies in this direction are desired.

News of the Industry

Death of James B. Duke

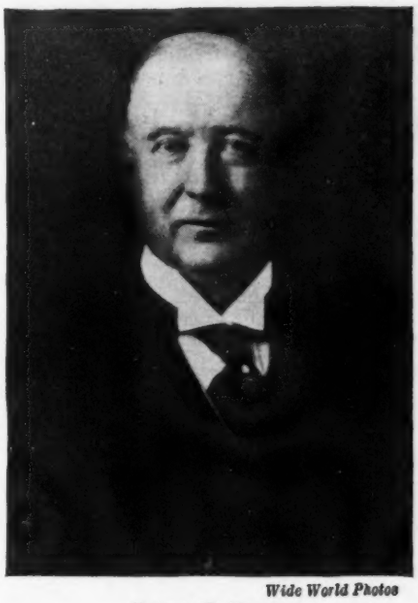
President of Southern Power Company and Pioneer of Hydro-Electricity in Southern States

THE death at his New York City home on Saturday, October 10, of James B. Duke removed an industrial promoter and capitalist who, after he had won fortune and fame in the tobacco business, turned his attention to the development of hydro-electricity to serve the cotton industry of the Piedmont region of the Carolinas, built up the Southern Power Company to its present great dimensions and had made a noteworthy start, in conjunction with the Price Brothers paper-mill interests, toward the production of enormous amounts of power on the Saguenay River in Quebec.

Mr. Duke was born on a farm near Durham, N. C., in 1857, and with his father and brothers began as a youth of eighteen the tobacco enterprise which reached such vast proportions. Early in the present century, seeking new fields for his tireless industry, commercial genius and desire to serve his native section, he became convinced of the part that might be played in the infant cotton industry of the South by the development of the great but theretofore little used water powers of that region. His attention turned to the possibilities of the Catawba River, and in 1904 the Catawba Power Company was merged with the Catawba Electric & Manufacturing Company as the Southern Power Company. Mr. Duke became the president and occupied that post until his death. The first plant was completed in 1904, the second, or Great Falls, plant in 1905, and the third, or Rocky Creek, plant in 1909. In 1906 the capital stock of the company was made $10,000,000; in 1908 it had contracts with 110 cotton mills in the Piedmont section, and when the third plant was completed the total rating of the three was 60,000 kw.

With this auspicious start, the company has continued to add plant after plant, building steam stations where necessary, until at the end of last year it had a total rating of 705,000 hp., with 125,000 hp. more under construction, ranking first in output among the great central-station companies of the South. The Southern Power Company has, under Mr. Duke's guidance, "played a lone hand" as regards its financial and operating control and methods, but its lines have long been tied in with the interconnected transmission network that covers the Southeastern States.

Owing to the great preponderance of water power on its system, the droughts of this year and of two years ago were especially severe on the Southern Power Company, forcing some curtailment of service, and only



Wide World Photos

JAMES B. DUKE

a few weeks ago its officials announced, after consultation with Mr. Duke, that a new 60,000-kw. steam plant would be built in the immediate future to assure the maintenance of a full power supply hereafter. He took a keen practical interest in water-power operation, acquiring the knowledge that made it possible for him during periods of low water to issue personal directions designed to insure the highest possible amount of service.

A few years ago Mr. Duke joined forces with Sir William Price of Montreal to develop the vast power at Lake St. John, on the Saguenay River, organizing the Quebec Development Company for this purpose. His partner in this enterprise lost his life in an accident just a year ago, but the development has gone on, and a plant rated at 225,000 hp. is scheduled for completion in 1927. With I. E. Davis, president of the Aluminum Company of America, Mr. Duke last summer acquired from the Price Brothers Paper Company the adjoining site at Chute à Caron, where 800,000 hp. will, it was announced, be eventually installed in ten units of 80,000 hp. each.

Mr. Duke was a philanthropist as well as a captain of industry, and his gift to Trinity (now Duke) University at Durham of a trust fund of $40,000,000, made up in part of three-fourths of his holdings in the Southern Power Company, made a stir in educational circles last December.

New England Power Pool Broadens

Boston Edison, Hartford Electric Light, Connecticut Power, Springfield, Turners Falls, Blackstone Valley and, Probably, Narragansett Companies to Join

RAPID progress was made this week in the inclusion of central-station companies in the financing plan for the further development of the New England Power Company system as outlined in the ELECTRICAL WORLD of October 10 (page 761). In addition to the participating companies previously announced, the Hartford Electric Light Company, Connecticut Power Company, United Electric Light Company of Springfield and the Turners Falls Power & Electric company of Greenfield, Mass., have decided to join the syndicate which will finance and operate the New England Company system, taking an interest of $1,000,000, or about 4 per cent, in the project. The Blackstone Valley Gas & Electric Company, Pawtucket, R. I., has decided to enter the pool, and an optional interest in the plan has also been offered to the Narragansett Electric Lighting Company, Providence. A vote on the matter was scheduled for a stockholders' meeting of that company on Friday.

On Wednesday President Charles L. Edgar informed a representative of the ELECTRICAL WORLD that the Edison Electric Illuminating Company of Boston will also participate in the new financing of the New England Power Company. Mr. Edgar said that the Edison company already has facilities and contracts for the exchange of energy with companies belonging to the New England Power system, and it is expected that, as a result of the new financing, facilities for the exchange of energy on a much greater scale will be afforded.

Inquiries in New England by the ELECTRICAL WORLD into the possibilities of this development indicate that through the participation of these established interests many advances in financing, operation and administration may be anticipated, including more extensive development along the lines of interconnection and pooling of steam and hydro-electric power resources and the closer co-ordination of new water-power developments in the Adirondack region with the New England Electrical network.

Details of the proposed financing are still in the making. As announced last week, the Power Corporation of New York, the International Paper Company and Stone & Webster, Inc., are prominently interested in this project.

Speaking of the participation of the

Hartford Electric Light Company in the project, President Samuel Ferguson said this week that the surplus water of the New England Power, Power Corporation of New York and International Paper companies will thus become available at times of floodwater to reduce the amount of coal otherwise required to supply Hartford's need for power and that at times of low water the Hartford company can increase its sales by supplying supplementary steam power. "This financial arrangement," said Mr. Ferguson, "pertains solely to the acquisition by the Hartford Electric Light Company of an interest in the reorganized New England Power Company. No interest in the Hartford Electric Light Company has been acquired by that or any other company, nor is any such acquisition under discussion or in contemplation."

State Regulation of Utilities Upheld

Hoover's Address in Its Defense Feature of Convention of National Association of Commissioners — Merrill on Interstate Commerce in Energy—Other Addresses

A VERY representative group of public service commissioners from all sections of the country was in attendance at the thirty-seventh convention of the National Association of Railroad and Utilities Commissioners at Washington, D. C., on Tuesday, Wednesday, Thursday and Friday of this week. The feature of the convention was the address of Secretary of Commerce Herbert Hoover at a special session on Wednesday evening. This address, which was broadcasted, is printed in part on page 815 of this issue.

W. D. B. Ainey of Pennsylvania in his annual address as president of the association suggested a radical change in the method of fixing rates. In his opinion valuation is not an essential prerequisite of rate determination. He said that the proper place for valuation is to form a defense which utility companies may set up as marking the boundaries beyond which commissions cannot go without subjecting the property to confiscation.

LAX ACCOUNTING—INTERSTATE COMMERCE IN ENERGY

O. C. Merrill, executive secretary of the Federal Power Commission, addressed the convention on "State and Federal Co-operation in Electric Utility Regulation." He referred to lax accounting methods on the part of many companies filing reports with the commission as required by law, and said that failure or inability to make occasional, if not periodical, audits of the accounts of electrical utilities, sufficient at least to assure that accurate records of transactions are being made and reported, is one of the weak points in existing state regulation. This deficiency has hampered the Federal Power Commission, and Mr. Merrill asserted that the determination of costs or values to date of license and the accurate accounting for all fixed capital charges and credits thereafter would not only furnish the data necessary for the efficient administration of the federal water-power act, but would also be of permanent value to the state commissions in furnishing a definite dependable record continuously available in connection with their subsequent supervision over and regulation of the corporations that operate properties under federal license.

After pointing out why neither federal nor municipal regulation could do the work of the state regulating commissions efficiently, Mr. Merrill came to "interstate commerce" in electrical energy, which, he said, may consist of the transmission and sale of energy produced in one state and transported and furnished directly to consumers in another state by the company so producing and transporting, or of the transmission and sale in wholesale quantities to a distributing company, the transporting company possessing no franchise rights for engaging in distribution itself.

It is under the first set of circumstances that the great majority of interstate energy transfers are taking place today, Mr. Merrill asserted, and, applying the decision of the United States Supreme Court in a case affecting interstate traffic in gas (Pennsylvania Gas Company vs. Public Service Commission of New York), he held that the state commission may regulate local service in the absence of federal legislation.

The second set of circumstances was illustrated in cases affecting the Kansas Natural Gas Company where the Supreme Court held that "the paramount interest is not local but national, admitting of and requiring uniformity of regulation." This rule, Mr. Merrill thought, would also be applied to electrical energy transported in bulk to a distributing company in another state. He took up two or three methods by which it had been held that the states could exercise authority indirectly in such circumstances, but declared them to be, in his opinion, complicated and unworkable.

"I am convinced," Mr. Merrill said, "that any general federal regulation is both unnecessary and unwise, but such a conclusion does not support proposals for ignoring sound regulatory principles or for the creation of artificial agencies far more cumbersome and ineffective than anything they are created to supplant. With the powers which the states possess and with those which they may exercise under the ruling in the Pennsylvania-New York case all that remains outside their authority is the determination of the wholesale price in interstate transactions and sufficient regulation of the service in such cases to prevent interstate discrimination. This authority is already conferred upon the Federal Power Commission in so far as its licensees are concerned. It remains unconferred at present in all other cases. . . . Through co-operative action, and without violence to our system of government, it should be possible to cover the field effectively and without duplication, permitting no twilight zone of uncontrolled operations, but leaving all the real essentials of regulation where in my opinion they belong—in the hands of the several state commissions."

A great part of the program was devoted to consideration of railroad traction and express problems. There was open expression and protest against the tendency of Congress to encroach on state control of utilities. An elaborate report on public relations was made by E. I. Lewis of the Interstate Commerce Commission, a significant evidence that the public service commissions are keeping in step with regulated utilities in this regard.

That mergers and consolidations offer advantages in the operation of public utilities and contribute greatly to the improvement of the service and its consequent enhancement and value to the public was expressed as the opinion of M. H. Aylesworth, managing director of the National Electric Light Association, in an address before the commissioners on Wednesday morning. Mr. Aylesworth said that a very effective way of bringing such consolidations about is through the instrumentality of so-called holding or investment companies. He contended that it is not the policy of holding companies to replace responsible management by absentee landlordism, but rather to strengthen the management in the interests of better service and better public relations.

BUSINESS AND UTILITIES

A feature of Thursday's sessions was an informal address by Lewis E. Pierson, New York banker, in the national council chamber of the United States Chamber of Commerce. Mr. Pierson said that American business is not concerned with utility schedules and rates, but that it relies upon the various commissions to see that rates are just and reasonable and that the public rights are protected. American business, he said, is vitally interested, however, in the standards of service which the utilities maintain.

The following officers were elected: President, A. G. Patterson of Alabama; first vice-president, J. F. Shaughnessy of Nevada; second vice-president, Henry G. Wells of Massachusetts; secretary, James B. Walker of New York; counsel, John E. Benton of Washington.

Company Enjoins Seattle from Extraterritorial Sales

An injunction against the city of Seattle and J. D. Ross, its superintendent of lighting, has been obtained by the Puget Sound Power & Light Company which prevents the city from selling electrical energy beyond the municipal limits. This injunction may eventually cut off from the city's lines about two thousand customers now being served outside the boundary, mainly to the north of the city. Legal questions, however, remain to be settled, and the final result is still in doubt.

The immediate cause of the suit was an agreement by the light department

to serve an industrial company at Renton, through which place the city's transmission line from Cedar Falls runs. The corporation counsel refused to defend this suit, and Superintendent Ross was represented by his own attorney; but the judge refused to hold the superintendent solely responsible. The corporation counsel will, despite his attitude, appeal to the Supreme Court, if a new trial is not granted, in the interest of the two thousand existing customers. Approximately six hundred of these are being served on contracts made prior to 1915, when the law authorizing the city to sell electrical energy outside its limits was repealed. The opinion is expressed by some attorneys that these contracts may be sustained. For another class of suburban patrons, and this includes the majority of the fourteen hundred obtained since 1915, the city delivers the energy to a meter at the city limits, and it is contended that this service also is within the law.

It is believed that the power company plans to bring test cases to settle definitely what view the courts take of the latter class of customers. A clear-cut victory for the company, it is pointed out, would not necessarily mean that action would be brought to require the city immediately to relinquish all outside business, as most of the out-of-town patrons are in districts not served by the power company at the present time.

President Coolidge Will Again Light Christmas Tree

President Coolidge has again agreed to light the "national Christmas tree" at Washington at 6 o'clock on Christmas Eve. The program at the tree, including the participation of the President, is under the direction of the Community Centers of Washington and will this year be broadcasted. The movement to establish at Washington a national symbol of good will through the "national Christmas tree," sponsored by the Society for Electrical Development in 1923, in co-operation with the American Forestry Association, the Community Centers of Washington, the local Electrical League and the Potomac Electric Power Company, culminated last year in the planting of a living tree, with a permanent underground electrical service installed.

To obtain the President's promise to light the tree for 1925 the following committee waited upon him at the executive offices on October 14: Representative Hamilton Fish, Jr., of New York; Herbert A. Wagner, president of the Consolidated Gas, Electric Light & Power Company of Baltimore, representing the Society for Electrical Development; Edwin C. Graham, president of the National Electrical Supply Company of Washington and president of the Board of Education of the District of Columbia; Mrs. Cecil Sisson Broy, director of the Community Centers, Department of Public Schools of Washington; William F. Ham, president of the Potomac Electric Power Company, representing the local electrical interests; Miss Evelyn W. Smith, the donor of the living Christmas tree, and F. M. Feiker, operating vice-president of the Society for Electrical Development.

Technical Committee Meetings Grow in Interest

Individual attendance and division representation at the committee meetings of the N. E. L. A. Technical National Section at Detroit last week were high, indicating an increasing interest in the value of these meetings. Considering the distance traveled, representation from the Far West was particularly good. In outlining programs and discussing technical developments, not only the chairmen but individual members repeatedly considered the relative importance of subjects, how needs of the near future might affect this importance and how the national and divisional organizations can best carry on their work.

The plan advocated a few years ago and most noticeably put into execution last year—namely, of having divisional committees serve their constituent needs by suggesting national or group studies, planning their own local programs and assisting in national undertakings co-ordinated by the national committees, which act as clearing houses—received even more hearty support this year. Serious consideration is being given to ways in which committees or sub-committees can give more thought to broad economic problems of technical nature, the relative importance of existing technical problems and means of preparing for approaching problems. Ways in which committee findings can be published with less expense but without curtailing the value of committee work also came up for discussion. The opinion was expressed repeatedly that some committee members have been lax in not conveying a message regarding the nature of their committee work back to their company executives.

This year a departure was made in devoting four days instead of three to committee meetings, to enable companies which send only one or two representatives to take advantage of more meetings than when they are all conducted in parallel. For example, during the first two days the electrical apparatus, inductive co-ordination, meter and prime movers committees held their meetings. During the last two days the accident prevention, hydraulic power, overhead systems and underground systems committees had theirs. While this arrangement served its purpose, hope was expressed that in the future a bigger representation from individual companies will permit the return to three-day sessions.

Commercial Section N. E. L. A. Will Issue Reports Serially

The need for better sales personnel and management was the keynote of the general meeting of the National Electric Light Association Commercial National Section committees held this week on Tuesday and Wednesday at the Edgewater Beach Hotel, Chicago. This was the first general gathering under the new chairman, E. W. Lloyd, and the meetings were well attended by central-station men from the East, Middle West and as far south as Little Rock and as far west as Salt Lake City.

Chairman Lloyd, who discussed the desirability of a better organized and more highly paid personnel, dwelt also on the importance of developing adequate statistics on sales to the home, in terms both of kilowatt-hour consumption and appliance sales, on a comparable basis that will provide a means of judging whether a sales department is doing a good or a poor selling job. Vice-chairman Heed made the added point that the time had come when central-station companies must decide whether they desire permanently to play the lone wolf in market building or join the entire local electrical family in an organized effort behind a constructive plan and policy in appliance selling. Around these two thoughts much of the discussion revolved. It is the purpose of the new committee on sales management organization under Mr. Heed to present to the next convention a definite program for such a revitalizing of central-station commercial practice.

The individual committees are planning extensive work this year which was discussed in detail. It is the intention to depart from the usual method of presenting their reports at the national convention and to publish them serially during the year in order to reduce the burden on the convention sessions and make the results of the committee work available earlier. The next general meeting of these national and executive committees will be held in Chicago January 14 and 15.

N. E. L. A. Committee Chairmen and Meetings

Organization of the Commercial National Section of the National Electric Light Association, under the chairmanship of E. W. Lloyd, Commonwealth Edison Company, Chicago, has been effected, with the following chairmen of committees:

Cooking and Water Heating.—A. C. McMicken, Portland, Ore.
Customer Relations.—F. F. Kellogg, Pittsburgh.
Electricity in the Home.—M. Luckiesh, Cleveland.
Industrial Lighting.—Joseph F. Becker, New York.
Load Factor.—R. H. Tillman, Baltimore.
Merchandising.—T. L. Phillips, Cincinnati.
Power.—V. M. F. Tallman, Boston.
Domestic and Small Commercial Refrigeration.—G. E. Miller, Cleveland.
Domestic Cooking and Heating.—A. D Dunton, Springfield, Ill.
Sales Organization and Management.—S. D. Heed, Cincinnati.
Transportation.—B. J. Martin, Chicago.
Wiring and Wiring Costs.—A. P. Good, Chicago.

Chairmen of the standing committees of the other national sections have already been printed in the ELECTRICAL WORLD. Meetings of the Accounting National Section committees will be held in St. Louis on October 21 and 22, and the national executive committee and committees of the Public Relations National Section will meet in Chicago on October 26, 27 and 28.

Southern California Edison to Add to Long Beach

Work is to begin immediately on the installation of a 50,000-kw. unit at the Long Beach steam plant of the Southern California Edison Company. This new unit will conform in general style and plan to the two 35,000-kw. units which make up Long Beach steam plant No. 2, which was built in record time last year. An addition to the present structure, including additional switch galleries of General Electric design, is to be built for the new unit. The coming installation will comprise a General Electric single-cylinder-type turbine rated at 50,000 kw., 50 cycles, three-phase, 11,000 volts; seven Stirling-type Connelly boilers built to operate at 375 lb. pressure and at a temperature of 725 deg. F.; Westinghouse condensers and burners capable of burning either natural gas or fuel oil.

The estimated cost of the new work has been placed at approximately $6,000,000, and the completion date has been tentatively set as July, 1926. Stone & Webster, Inc., who designed and built Long Beach steam plant No 2, have been engaged to lay out and construct the new station.

North Georgia to Have 110-Kv. 104-Mile Line

Announcement is made of the approaching construction by the East Georgia Power Company, a subsidiary of the Georgia Railway & Power Company, of a 110,000-volt line across northeast Georgia. This will be the largest piece of transmission construction started in Georgia for several years and will form an important link in the distributing network of the state. The line will run from the substation of the Georgia Railway & Power Company at Toccoa in a southeast direction in direct line through Stephens, Franklin, Hart, Elbert, Lincoln and Columbia Counties to the Stevens Creek hydro-electric plant of the Augusta-Aiken Railway & Electric Company on the Savannah River. It will cover a distance of 104.6 miles. A stock issue of $1,100,000 has been authorized by the Public Service Commission of Georgia to cover the cost.

New York Power Companies Seek Barge Canal Water

Hearing by the New York State Water Power Commission on the application of the Rochester Gas & Electric Corporation for permission to use the surplus waters of the Barge Canal at that point was adjourned last week to gather additional data. The company expressed a willingness to pay a rental for the water if assured of a supply at all times and proposed raising the dam six inches. Hearing on the application of the Lower Niagara River Power & Water Supply Company for a preliminary permit covering what is known as the lower Niagara gorge project was also adjourned.

A license was authorized to the Fulton Light, Heat & Power Company for use of the surplus waters of the Barge Canal at the east end of Dam No. 4, Oswego River, at Fulton, N. Y. The license will supersede an existing revocable permit. The rental will be about $15,000 per year.

The commission referred to the Attorney-General the enforcement of its determination, made in June last, of a yearly rental charge of $11,000 covering the licensing of the Massena weir, which the Aluminum Company of America, through its subsidiary, the St. Lawrence River Power Company, has failed to accept.

Sacramento-Merced Transmission Line Under Way

Interconnection between the Great Western Power and the San Joaquin Light & Power systems in California, now under common ownership, by means of a 220-kv. transmission line is to be hurried to completion. As stated in a former issue, this line is to connect Sacramento with Merced, 103 miles south. It will start at the Brighton substation of the Great Western, 6 miles east of Sacramento, and be built in a straight line to a point a short distance east of Merced, where it will make its only bend and terminate at an outdoor substation to be built a mile and a half from the latter city. Three construction crews are already at work.

Steel towers spaced 230 ft. apart will carry the line. It will be of twin-circuit construction, though only one circuit will be strung at the present time. The conductors are to be of aluminum, 1.093 in. in diameter, with a conductivity rated at the equivalent of 500,000-circ.mil copper The conductors will be spaced 16 ft. on the vertical plane, and there will be 27-ft. 4-in. spacing between circuits. Pacific Coast Steel Company towers will be used. The substation at Merced is to have a bank of 50,000-kva. transformers, and the condenser will be of 250,000-kva. capacity. The line will be operated at first at 165 kv., but the entire equipment will be 220-kv.

Electrical Delegates from French Republic Visit Hell Gate Power Station

IN THE above picture appear the members of the delegation of French electrical executives and engineers now touring the United States. They are grouped at the entrance to the Hell Gate power station of the United Electric Light & Power Company, New York, and are surrounded by American confrères and New York company men who accompanied them in their visit to the plant. Arm in arm with John W. Lieb, vice-president New York Edison Company, is Albert Petsche (15), president of the Union d'Electricité of Paris, who heads the party. Colonel Ernest Mercier, general manager of the Union d'Electricité, and Maurice Saurel, manager of the Compagnie Française Thomson-Houston, were not in the group at the moment. The other visitors are:

1. Emil Pinson.
2. René Hochstetter.
3. Paul Eschwege.
4. R. de Valbreuze.
5. Aug. Boissonnas.
6. L. J. Sartre.
7. Edouard Roth.
8. Edouard Imbs.
9. M. Deteuf.
10. Louis Astier.
11. Albert Malle.
12. J. A. Arrighi de Casanova.
13. Jean Partridge.
14. Edmond Aubert.
16. Paul Meunier.

Opposes Federal Control of Utilities

Secretary Hoover, Speaking Before National Association of Commissioners, Answers Four Arguments Made for It—Intervention from Washington Needless

ONE of the outstanding addresses made at the Washington convention of the National Association of Railroad and Utilities Commissioners this week, of which a report is printed on another page, was that by Secretary of Commerce Herbert Hoover on "Why the Public Interest Requires State Rather than Federal Regulation of the Electric Public Utilities."

Asserting that regulation of the rates, profits and service of utilities so as to maintain the initiative of the industry on the one hand and to protect the public from exploitation on the other is a science in itself, Secretary Hoover pointed to the progress due to there being forty-eight experimental laboratories of regulation learning from one another as compared with what could have been accomplished by any one of them alone or by a single federal authority. Rate regulation, methods of valuation, the principle of public convenience, which has limited wasteful competition, and the regulation of security issues have, he said, all been tried first by some one state and then have seen gradual adoption. Many things also have been tried and found wanting. If these failures had been encountered on a national scale, with the difficulty of reversing obsolete national policies, progress in the whole nation would have been stifled and many successful ideas would never have been born.

"In the practical state in which the nation finds itself today in the matter of power rates," said Mr. Hoover, "three facts seem apropos. The first is that regulation and progress in the industry are providing here a commodity—electricity—at pre-war prices. It is about the only one in the nation. The second fact is that the total distribution of interest and dividends by the electric companies taken as a whole has never yet exceeded 6 per cent upon the values of all the properties for rate-making purposes. The third fact is that the industry has expanded to meet public demand by fourfold in ten years. The state commissions may well claim a large portion of the credit for these conditions—their regulation has been effective. Before we abandon the system let us be sure that we have something better to take its place."

No Need for Federal Control

Emphasizing the general agreement that government regulation of utilities is vital and alluding to the economic revolution involved in long-distance transmission lines and interconnected systems—a revolution which, though not monopolistic in essence, has led to an agitation for federal rather than state control—Mr. Hoover thus summarized the arguments made for national regulation:

"First, it is contended that watering of stocks is now in progress in the operating or holding companies and that this inflated capitalization may be reflected in increased rates; second, that the extension of lines across state boundaries is creating a legal interstate problem over which the states have no authority; third, that some of the states have not yet set up adequate administration for protection of the public interest and that this delinquency in state action warrants federal intervention; fourth, that this evolution of industry has developed 'trusts' which will defy public interest until democracy shall not be able to rule in its own house."

Taking up these assertions in their order, Mr. Hoover proceeded to answer them, saying in part:

"The first argument, that overcapitalization or watering of stocks places a burden upon the consumers, falls to the ground at once if all the states universally adopt the principles of state regulation now demonstrated in many of them. There may be a watering of stocks in progress, but if rates be based either upon the true value of plant and equipment or upon actual investment, watered capital does not and cannot affect consumers. . . ." Speculation in the stock of holding companies, Mr. Hoover pointed out, however much open to criticism, cannot affect the consumers' bills.

No Parallel with Railroads

"The second of the reasons advanced for the government taking over control," said Mr. Hoover, "requires analysis, for the question has both economic and legal phases." He proceeded to show that no parallel exists between transmission systems and railroads, since the buyer of power has no concern with rates in other states, while the shipper of goods is vitally affected by them. Furthermore, he said, there has been "outrageous exaggeration" of the probable extent of interstate power. At the present time less than 2 per cent of the power developed passes state lines, and though this proportion will increase, the movement is of high importance for economy in power production.

"Interstate problems arise only where the activities of the operating companies extend beyond state lines," said Mr. Hoover. "They fall into two classes—first, where the same company is engaged in generation and distribution over a district embracing parts of two or more states, and, second, where an operating company purchases power generated in a foreign state—the latter instance also embracing the 'interconnection' between districts lying in different states. As to the first class, it has been well established by the courts in analogous instances that the state commissions have the power and authority to establish 'reasonable rates' to their consumers whether the property may be wholly within the state or not. These cases take care today of the large proportion of the 2 per cent passing our state lines. There remains, therefore, a small fraction of the problem, where the distributing company buys power by interconnection or otherwise from outside the state. Here the question is simply as to whether the rate paid for the purchased power is reasonable. If unreasonable, the commission may refuse to allow its full amount in settling the rate base. It is open to the commission to fix a rate for resale to consumers within its jurisdiction based upon what the commission considers a fair price, the companies having the usual recourse to the courts for redress against injustice.

"It is difficult to conceive of a situation which, so far as public interest goes, could not be controlled in this simple and effective manner. It needs no new machinery, no complicated interstate compacts between each of forty-eight states and its numerous neighbors, each requiring sanction by Congress. If, in the passage of time and the accumulation of experience, the unexpected, either economic or legal, should happen and we find an occupied field requiring regulation, it will be time enough then to talk of federal control. No such condition exists today or is apparent in the future.

States Have the Power

"The third contention is that some of the states have not or will not set up adequate machinery for protection of the public interest, and that, therefore, the federal government should intervene to protect their citizens. This is . . . the negation of self-government, and federal encroachment for this reason means its ultimate extinction. If we had yielded to these pressures in years past and attempted to remedy the failures of municipal and county and state government by substituting federal control, we would have no sense of local government left, and we should have seen none of the great improvement in local government which we have witnessed in the past thirty years.

"The fourth contention is that this evolution of the industry has developed 'trusts' which do or will defy public interest. . . . The ownership of 100,000 hp. would have been a trust only fifteen years ago. Today in order to get cheap power we build that much in a single machine and somebody has to own it. At the present time there are about three hundred separate operating companies or districts covering more than twenty-five thousand people—there are some three thousand in smaller communities. The largest of these districts covers Niagara Falls, about 5 per cent of the total electrical power generated in the nation. Through holding companies some of these districts are under common control. The largest of such groups furnishes less than 10 per cent of the total power.

"But this question of maleficent trusts—this fear of injury by giants—comes to this: Have state authorities the power to rule their own houses? They certainly have. They have the same power to regulate big electrical companies as small ones, and I do not doubt that they will use it.

"There is an economic question involved in this matter of the development of power districts," Mr. Hoover continued, "which I believe needs the

attention of the state commissions, and action upon which would cure the evil if such should develop. There is a limit to the size to which operating districts should be extended. The economies of central generation, of best diversity of load, have a territorial limitation in each case, beyond which no advantage is gained. Moreover, the attention to service and response to local responsibility decrease after some maximum area has been reached. The best use of surplus power from one district to another can be reached by purchase and sale through interconnection of districts. Moreover, it is important to preserve a large number of districts in order to stimulate invention and improvement and, upon failure of a district operating company, thus to keep open the door of competition as the final remedy. Therefore, it seems to me highly desirable that the state commissions should study this problem in its broad aspects and through their undoubtedly existing powers scrutinize and disallow consolidations unless economic value to the community can be demonstrated."

Secretary Hoover concluded his address by a further defense of our dual system of government, stressing the importance of maintaining state and local responsibility and avoiding the need or demand for federal invasion of state powers.

Briefer News

Western Utilities Buys Malad (Idaho) Plant.—The sale of the Evans Light Company, operating in Malad, Idaho, to the Western Utilities Company has just been announced. This plant was built in 1906 and has been in continuous operation since that time.

Electrical Supply Jobbers' Association.—From November 18 to November 20 inclusive the Electrical Supply Jobbers' Association will hold its general meeting at the Hotel Statler, Buffalo, executive and sectional committee meetings being held on the two previous days.

A New Mexican Municipal Plant to Go.—At an election just held at Clovis, N. M., with 5,000 population, a favorable vote was cast on the proposal to sell the municipal electric light and water plants to the New Mexico Utilities Company, which is subsidiary of the Texas Utilities Company.

Wisconsin Utilities Accounting Section.—A meeting of the Accounting Section of the Wisconsin Utilities Association will be held at the Hotel Loraine, Madison, on October 23. Chairman L. H. Boutell will make an address, C. G. Blough of the Wisconsin Tax Commission will tell how public utilities are assessed in that state, W. A. Toellner and A. A. Cavanaugh will read papers, H. H. Wilson of the Railroad Commission will discuss the revised classification of accounts for electric utilities, classes C and D, and there will be reports and discussions on accounting subjects. At the annual dinner in the evening W. C. Reyer, New York, is to speak.

Missouri Plant Changes Hands.—The Missouri Public Service Commission has authorized the sale by the Mountain Grove Creamery, Ice & Electric Company of its plant and franchises to the Missouri Electric Power Company. The price to be paid is $90,000.

Chehalis, Wash., Protests Against Grant of Power Site to Tacoma Applicant.—The city of Chehalis, Wash., plans a protest against the proposed development of the Mayfield power site, for which application has been made by C. C. Garland of Tacoma. The Sanderson & Porter interests of New York, represented in Chehalis by H. W. Crozier, have made application for the site and give assurance of intent and financial ability to develop it at an early date. This firm is working in conjunction with the Cowlitz, Chehalis & Cascade Railway Company.

Davenport Sticks to Central-Station Lighting.—The lighting committee of the City Council of Davenport, Iowa, has recommended that the street-lighting franchise of the People's Light Company be renewed on virtually the old terms. A new lighting system is to be installed, and agitation was rife for a municipally owned and operated plant. Expert engineering advice showed that, in addition to the heavy initial expense, the cost of maintenance and operation would be 35 per cent more than would be paid in rates if the franchise were renewed.

Texas Plants Change Hands. — The electric light and power plant of the West Texas Electric Company at Snyder has been purchased by the Texas Power & Light Company of Dallas. Additional machinery will be installed and a power transmission line constructed from Sweetwater to Snyder, 40 miles. The Houston Lighting & Power Company has purchased the plant of the La Porte Light & Ice Company. The purchasing company has started work on a 14-mile high-tension line to supply current to La Porte and Goose Creek.

Prairie du Chien Votes Against a Municipal Plant. — Another decisive blow was dealt against municipal ownership in Wisconsin when on September 29 the voters of Prairie du Chien rejected by a vote of 836 to 188 the proposal of the Public Works Board to bond the city to the extent of $57,000 to provide funds for the erection of a municipal power plant. The Interstate Power Company supplies the city, and the election was the outcome of an attack on its rates.

Southern Sierras Power Company Applies for Revaluation.—Application has been made to the California Railroad Commission by the Southern Sierras Power Company for a revaluation of its plants and properties for the purpose of fixing new rates. The applicant alleges that the present rates as fixed by the commission are unreasonable and confiscatory. The company operates in Mono, Inyo, Kern, San Bernardino, Riverside, Imperial and San Diego Counties in southern California.

Portland Electric Power Extends System.—By acquiring the distribution system and franchise rights of the St. Helen's (Ore.) Light & Power Company, the Portland Electric Power Company has added 650 customers to its system. Until a transmission line can be built the new district will continue to be supplied from the plant of the St. Helen's Lumber Company.

Southern Cities Power Company Acquisitions Ratified.—Sale of the electric light and water plant at Columbia, Tenn., and the lease of the Fayetteville (Tenn.) light plant to the Southern Cities Power Company has been officially ratified by the state commission. The Southern Cities Company paid $301,275 for the capital stock of the Columbia Water & Light Company and assumed $292,000 in outstanding bonds.

New 55-Mile Transmission Line in Oklahoma Under Way.—Fifty-five miles of new transmission line will soon connect cities and towns on the Nowata-Vinita system of the Public Service Company of Oklahoma with the plant of the Oklahoma Power Company at Tulsa, according to Fred W. Insull, president of the Public Service Company. The new line will carry 33,000 volts and will serve several communities in Rogers and Nowata Counties that have not hitherto been reached by high-tension lines.

Minneapolis Abandons Municipal Lighting Experiment. — Two hundred and twelve street lamps installed a few years ago by the city of Minneapolis as an experiment in municipal street lighting by means of a generator installed in a garbage-incinerating plant have been taken over by the Minneapolis General Electric Company, which will install a new transmission system in the ward affected and scrap the city's plant. The theory that since fuel would cost nothing the city would find the plant economical did not prevent annual losses and unsatisfactory service.

Puget Sound Company Gets Emergency Power from Stave Falls as Drought Persists.—For the first time power was transmitted across the British Columbia-Washington boundary under emergency conditions when connection was made recently between the lines of the Puget Sound Power & Light Company and the British Columbia Electric Railway Company, Ltd. A total of 13,000 kw. was sent south over the interconnected lines from power generated at Stave Falls, B. C. The lack of rain in the Pacific Northwest this fall has created a decided shortage of electric power throughout Washington. This shortage is felt by the municipal plants. Tacoma is buying about 100,000 kw.-hr. daily from

Seattle, which is forced to operate its steam plants to spare the energy. Tacoma is also buying from local manufacturing plants and is operating its steam plant to capacity.

Lincoln (Neb.) Companies Defer Amalgamation.—Application has been made by the Continental Electric Company, the Lincoln (Neb.) Gas & Electric Company and the Lincoln Traction Company for an extension of the time given them to complete a merger agreement from October to April next.

Virginia Railway & Power Buys Williamsburg Plant. — The Williamsburg (Va.) Power Company has been purchased by the Virginia Railway & Power Company, according to an announcement just made by the owners of the Williamsburg property. The purchase price was not made public, but it was announced that about $45,000 will be spent in improvements on the Williamsburg plant in the near future.

E. B. Craft to Address Philadelphia Engineers.—Before a meeting of the Engineers' Club of Philadelphia on Ooctober 20, at 7 p.m., E. B. Craft, executive vice-president of the Bell Telephone Laboratories, will deliver an address on "Today's Research—Tomorrow's Engineering." The address will be followed by a discussion in which prominent engineers and scientists are to participate.

To Apportion Territory in Birmingham.—The Birmingham Electric Company and the Alabama Power Company have petitioned the Alabama Public Service Commission to define the boundaries of the two companies so that their services may not overlap in the Birmingham district. The rate schedules of the two companies differ but slightly, and the petition involves the transfer of several hundred customers to the Alabama Power Company's lines.

Weymouth Station Renamed for C. L. Edgar.—In honor of thirty-eight years of service of President Charles L. Edgar of the Edison Electric Illuminating Company of Boston, the board of directors has passed a resolution which orders that the new station in Weymouth be named the Charles Leavitt Edgar station and that this name be inscribed on the building, which is to be designated as "the Edgar station" in all official documents and publications.

How the Power Show at New York Has Grown.—Preparations are well advanced for the fourth national exposition of power and mechanical engineering, which will be held in the Grand Central Palace, New York, from November 30 to December 5. A series of exhibits of heating and ventilating machinery will form an important addition to the lines usually represented, and combustion equipment, valves and fittings for high-temperature service, measuring and recording instruments, non-ferrous metals and prime movers will have their usual prominent place. The attendance at the Power Show in the three years of its existence rose from 48,000, the first year's attendance, to 79,000 last December. In 1922 there were 100 exhibits on one floor of the Palace, while the third show housed 360 exhibits and nearly filled three floors. Up to last week all of the first two floors of the Grand Central Palace and 90 per cent of the space on the third floor had been taken for this year's show. A series of lectures on the important developments in power and mechanical equipment during the preceding year will be given. The topics will include steam prime movers, oil and gas engines, steam boilers, modern industrial power plants, hydraulic machinery and other topics of interest to power engineers.

Rapid Progress on Suffolk-Roanoke Rapids Line of Virginia Railway & Power Company.—Early completion of the new 110,000-volt transmission line of the Virginia Railway & Power Company between Suffolk, Va., and Roanoke Rapids, N. C., a distance of 65 miles, is predicted by officials of the company, which bought the Roanoke Rapids Power Company last year for $1,000,000. This line will be connected with the high-tension line from Richmond to Norfolk built last year. It will cost about $900,000 and is carried on 80-ft. steel towers. The line has a capacity of 15,000 kw. and is so designed that a second circuit of the same capacity can be installed. It will form a main trunk line for interchange of power between the Virginia steam stations and the hydro-electric stations on the Roanoke River, where it is thought generation on a much larger scale will be undertaken. The line between Richmond and Norfolk has been reinforced to handle the additional power, new substations having been built in cities affected. The new line will tie all of the power plants and substations of the Virginia Railway & Power Company into a unified system. It will pass through Holland, Franklin, Boykins and Newsoms, Va., and Seaboard, N. C.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see ELECTRICAL WORLD, July 4, page 50.]

Electric Power Club—Briarcliff Manor, N. Y., Oct. 19-22. S. N. Clarkson, B. F. Keith Bldg., Cleveland.

Association of Edison Illuminating Companies — New Arlington Hotel, Hot Springs, Ark., Oct. 19-23. Preston S. Millar, 80th St. and East End Ave., New York.

Association of Railway Electrical Engineers—Hotel Sherman, Chicago, Oct. 20-24. J. A. Andreucetti, 413 C. & N. W. Terminal Station, Chicago.

American Welding Society—Boston, Oct. 21-23. M. M. Kelly, 29 West 39th St., New York.

Kansas Public Service Association—Topeka, Oct. 22-23. H. Lee Jones, Topeka, Kan.

Iowa State Association of Electrical Contractors and Dealers—Waterloo, Iowa, Oct. 27.

Southeastern Geographic Division, N. E. L. A.—Chattanooga, Tenn., Oct. 29-30. E. T. O'Connell, Alabama Power Co., Birmingham.

American Engineering Council — Administrative Board, Columbus, Ohio, Oct. 29-30. L. W. Wallace, 26 Jackson Place, Washington, D. C.

Public Utilities Association of West Virginia—Kanawha Hotel, Charleston, W. Va., Oct. 30-31. A. Bliss McCrum, 514 Charleston National Bank Bldg., Charleston, W. Va.

Associated Manufacturers of Electrical Supplies—New York, Nov. 9-13. F. Nicholas, 30 East 42d St., New York.

Electrical Supply Jobbers' Association —Hotel Statler, Buffalo, Nov. 16-20. Franklin Overbagh, 411 South Clinton St., Chicago.

Electrical Credit Association, Central Division—Hotel LaSalle, Chicago, Nov. 19 and 20. F. P. Vose, 1008 Marquette Bldg., Chicago.

American Society of Mechanical Engineers—New York City, Nov. 30-Dec. 4. C. W. Rice, 29 West 39th St., New York.

American Society of Agricultural Engineers, North Atlantic Section—Schenectady, N. Y., Dec. 10-12. Raymond Olney, St. Joseph, Mich.

Westchester County (N. Y.) Consumers Attack Rates. — Recommendations have been made by the Committee of Counsel of Westchester County (N. Y.) Municipalities, in support of an attack upon the rates charged for electricity by the Westchester Lighting Company, that an action asking for at least a 25 per cent reduction in the rates should be started before the New York Public Service Commission. The cities of Mount Vernon, New Rochelle and Tarrytown are involved in the contemplated complaint, but it is reported that White Plains will not join them. A résumé of figures from the report of the Westchester Lighting Company for 1924, as made to the Public Service Commission, is given as the basis upon which the charge is made that the company's profits are excessive and entirely unreasonable. Besides the four places named, the company serves many districts and large villages in Westchester County, which contains a prosperous suburban territory tributary to New York City.

Four States Again Attack Water Diversion at Chicago. — Diversion of water from Lake Michigan by the Chicago Sanitary District entered upon a new phase of court procedure last week when a motion was entered in the United States Supreme Court by the Attorney-General of Wisconsin for permission to file an amended bill in the suit of that state against the State of Illinois and the Sanitary District. In this amended bill Minnesota, Ohio and Pennsylvania join Wisconsin as complainants. The new bill seeks to prevent any withdrawal of water from Lake Michigan by the Chicago Sanitary District on the ground that withdrawals at Chicago already have lowered the lake levels six inches and that navigation on the Great Lakes as a whole is being interfered with seriously. The bill also questions the authority of the Secretary of War to grant a permit to the Sanitary District for any permanent diversion whatsoever. It is understood that the State of Michigan intends later to file a separate suit against Illinois and the Chicago Sanitary District, taking the position that not even Congress has the power to authorize diversion of water from the Great Lakes.

Men of the Industry

M. C. Rypinski, vice-president of the Brandes Products Corporation, has been elected treasurer of the Associated Manufacturers of Electrical Supplies to succeed H. W. Bliven of Harvey Hubbell, Inc., who has resigned after three years of service in that office.

R. B. McPherson has been appointed general superintendent of the electrical department of the Utica (N. Y.) Gas & Electric Company to succeed E. P. Peck, who has been promoted to the office of vice-president in charge of engineering, construction, electrical operation and distribution.

George S. Jones, Jr., has resigned as commercial manager of the Texas Power & Light Company and is now affiliated with the Dallas Power & Light Company as assistant general manager. Mr. Jones is succeeding J. H. Gill, resigned.

Kerr Atkinson, who for the past six years has been associated with Roderick D. Donaldson of New York in general consulting work, is joining the staff of Jackson & Moreland, consulting engineers of Boston. Mr. Atkinson has been engaged on power-plant and electrical transmission problems and expects to continue in the same field.

Homer Ludden, who had been superintendent in charge of the municipal electric light and water plant at Elkhorn, Wis., for the past five years, has resigned from that post to join the Wisconsin Valley Electric Company. He will be in charge of the Waupaca Electric Service & Railway Company, recently acquired by the Wisconsin Valley organization.

James P. Painter, who has been serving as secretary of the Public Service Commission of the State of Missouri, has been appointed assistant general counsel to succeed D. B. McDonald, recently advanced to the position of general counsel. **Larry Brunk**, State Senator, has been named secretary of the commission.

J. Allan Smith, Jr., formerly with the washing machine department of the Pacific States Electric Company, has affiliated himself with the sales force of the Majestic Electric Appliance Company and will make headquarters at Dallas.

C. O. Mailloux, consulting engineer of New York, returned from Europe September 30 on the steamer *France* after an extended visit abroad. While in France Dr. Mailloux was the recipient of many honors and attentions. He was made one of the honorary presidents of the third international high-tension conference held in Paris and headed the group of delegates who were officially received by the President of the French Republic at the Elysée Palace.

John H. Bothwell, principal owner, president and director of the West St. Louis Water & Light Company, has sold his holdings and resigned from the company to establish residence in Sedalia, Mo. **W. W. Henby**, who was secretary-manager, has succeeded to the presidency, and **W. A. Brennan**, formerly assistant secretary, is now secretary. Mr. Bothwell was made president of the company in 1904, two years after it was organized.

W. S. Rugg and E. D. Kilburn New Westinghouse Vice-Presidents

At a meeting of the board of directors of the Westinghouse Electric & Manufacturing Company held last week Walter S. Rugg and Edward D. Kilburn

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W. S. RUGG

were elected vice-presidents of the company. Mr. Rugg will take over the direction of engineering activities and Mr. Kilburn will direct the sales. Both of the new vice-presidents have been connected with the Westinghouse company for many years.

Mr. Rugg was born at Broadhead, Wis., and was graduated from Cornell University. He entered the engineering department of the Westinghouse Electric & Manufacturing Company in 1892, but later joined the sales forces of the Chicago office. In 1901 Mr. Rugg was transferred to the New York office

E. D. KILBURN

as special engineer, becoming manager of that office eight years later. In 1917 he was called to the East Pittsburgh works of the Westinghouse company and made manager of the railway department. Subsequently he was placed in charge of the sales work.

Edward D. Kilburn was born in Malone, N. Y., and was graduated from Cornell in 1906 in electrical engineering. He entered the apprenticeship course of the Westinghouse company and, following graduation, joined the sales department. In 1914 he was made manager of the railway lighting division of the New York office and in 1917 manager of that office. In 1920 he was elected vice-president and general manager of the Westinghouse Electric International Company.

Mr. Kilburn will retain his office as vice-president of the Westinghouse Electric International Company. **Dean K. Chadbourne** will succeed Mr. Kilburn as general manager of the International company.

Obituary

Rush B. Morrow, engineer in the light and power department of the Portland (Ore.) Electric Power Company, died October 4, after a long illness. Mr. Morrow had been with the Portland company since 1920.

John R. Emery, a director of the Oswegatchie Light & Power Company, Gouverneur, N. Y., died suddenly September 22 in his seventy-sixth year. Mr. Emery, who was a native of South Berwick, Me., had resided in Montclair, N. J., for a number of years. In addition to his affiliation with the Gouverneur utility, he was identified with other industrial organizations.

Alan C. Crago, research engineer with the Westinghouse Electric & Manufacturing Company, East Pittsburgh, died September 14 after a brief illness. An associate of the American Institute of Electrical Engineers, Mr. Crago was joint author of a paper presented at the last midwinter convention. He was born in South Sharon, Pa., in 1901 and was graduated from the Carnegie Institute of Technology in 1923.

Stacy Hamilton, for some years assistant to the president of the Portland (Ore.) Electric Power Company with the title of organization inspector, died October 1, after a long illness. Mr. Hamilton spent his boyhood in San Francisco and was at one time employed by the Western Electric Company there. In 1907 he went to Portland and took a position in the light and power department of what was then the Portland Railway, Light & Power Company, being occupied with rate studies and statistical records. In 1920 he was transferred to the office of the president.

David I. Dawbarn, electrical engineer with the Allis-Chalmers Manufacturing Company, Milwaukee, was killed in an accident October 1 when his automobile overturned. Mr. Dawbarn was born at Formby, Lancashire, England, July 19, 1896, and received his general and technical education at Merchant Taylors School, England, and at the University of Liverpool. Prior to coming to the United States he was connected with A. Reyrolle & Company, Hebburn, England, manufacturers of electrical switchgear. Mr. Dawbarn was a member of the A.I.E.E.

Commission Rulings

Denial of Revaluation Where Former Valuation Was Complete.—The Michigan Public Utilities Commission denied an application for a revaluation *de novo* of the property of the Holland Gas Works, declaring that in a former valuation every element upon which the commission had any proof, including all the elements that could be considered at the present time, was considered. That valuation, the commission pointed out, was finally accepted by the utility. Readjustments could, however, be made to meet present-day conditions. Substantially the net additions to capital since a former valuation should be allowed at actual cost.

Refusal to Permit Stock to Be Issued Against Going Value.—The Blue River Power Company asked the Nebraska State Railway Commission for an authorization of stock issued in part against going value. Rejecting the petition so far as this principle was concerned, the commission said that the decisions of courts and commissions recognized an intangible element of value in an operating public utility property which arose from the cost of developing the business and the prospect of earnings in the future, and that no doubt a willing buyer would see an intangible value in the present utility which would affect the price he would pay for the property. None the less, the commission said: "If the assets of applicant should carry an account with intangibles, particularly the going concern intangible, and no stocks were issued against those assets, the surplus account would reflect their existence in the books, and the surplus account would be both earned and unearned. Our rule has been that we would not permit the capitalization of unearned surplus, unless the corporate necessity was very clear. It is not clear here. It seems quite probable also that an issue of stock against going value assets would violate the provisions of the state constitution."

Parent Company Not Forced to Take Part in Rate Case Instituted by Subsidiary.—The Imperial Company, which had conveyed its franchise and utility business to a newly formed subsidiary, the Utility Gas Company, was held by the West Virginia Public Service Commission not to be the real party in interest in a case instituted by application of the subsidiary company for increased rates. As summarized in *Public Utilities Reports*, the parent company had previously instituted a proceeding to obtain increased rates, but, finding that the investigation would compel the opening of its private records, it formed the subsidiary company. An injunction to restrain the assignment of property to the subdiary and to compel operation by the parent company was dissolved by the courts. In overruling a motion for dismissal of the subsidiary's application on the ground that it was a mere agent, and in overruling another motion that the commission make the parent company a party to the proceeding, the commission said: "For the greater part, these motions are answered by the ruling of the Supreme Court of Appeals. The lack of the necessity of making the Imperial Company a party to the application is further indicated by the Public Service Commission law. Under this law a public utility applying for a change in rates must justify its rates and to do it must justify its operating expenses. When the Utility Gas Company applied for an increase of rates it was, by reason of the close relation between the companies, bound to justify the amount paid by it to the Imperial Company for gas. The record is full of evidence as to the cost of the gas to the Imperial Company."

Recent Court Decisions

Stockholders of Water Company Holding Contract with Power Company Cannot Sue Latter as Individuals.—The Modern Electric Water Company had a contract with the Washington Water Power Company to furnish energy for pumping and domestic purposes. Stockholders of the former used the energy for industrial purposes, and the trustees of the water company supported the power company in maintaining that the energy furnished under contract could be used only for the purposes specified in the contract. The Opportunity Christian Church and others thereupon sued the Washington Water Power Company and the Modern Electric Water Company, as stockholders in the latter, in an endeavor to force the supply of energy. The Supreme Court of Washington finds that, in the absence of fraudulent, arbitrary or *ultra vires* acts by the trustees, the stockholders cannot go over their heads to bring suit. (238 Pac. 641.)*

Maintenance of Dangerous and Unprotected Agency, Attractive to Children, Constitutes Negligence.—In Stark vs. Holtzclaw (receiver) the Supreme Court of Florida reiterated the principle that, though transmitters of electricity are not insurers of the safety of children or adults and are not held to a degree of care, prudence and foresight beyond that which prudent and careful persons have to exercise in such circumstances, none the less, "under common-law principles, one may not, even upon his own premises, maintain a dangerous and unprotected agency, naturally attractive to, and from which injury may reasonably be expected to result to, very immature children, even though they be licensees or trespassers, where their presence on the premises and exposure to the danger may be reasonably anticipated and the children are too young to realize and appreciate the danger." In this case the Pensacola Electric Company had maintained an electric line running through a large magnolia tree on its right-of-way. Since the tree was adjacent to a public school and to one of the company's electric railway stations and was of a type which could be easily climbed, the court held that it was attractive to children and that the company was negligent in not making sure that its wires were properly insulated. (105 So. 330.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

St. Louis Company and United States Government Reach Adjustment in Jefferson Barracks Case.—On joint motion of both parties to the suit, the appeal of the United States from a decree of the Federal District Court of Eastern Missouri in favor of the Union Electric Light & Power Company of St. Louis has been reversed by the Supreme Court and remanded for further proceedings in the lower court. The power company sued for energy supplied Jefferson Barracks, and the government replied by contending that the contract rate was increased without proper authority, although admitting that authorized officers signed the contract, and claimed an offset. The lower court awarded the company the amount claimed plus interest. By the further proceedings in the lower court this award will be scaled by agreement.

No Riparian Rights Accrue to Purchaser of Land on Artificial Pond.—In Caflisch vs. Clymer Power Corporation, the Supreme Court of New York, sitting in Chautauqua County, held that a purchaser of land bordering on a storage pond formed by an artificial lake acquired no riparian rights and could not require the water in the pond to be kept at certain levels. The dam had been built and the lake formed by the original owners in order to operate a grist mill below the dam. In 1907 the plaintiff purchased a site on the lake above the dam and erected a sawmill to which logs were floated on the pond. In 1917 the grist mill and dam were sold and converted into a hydro-electric plant to furnish power to the surrounding territory. The storage water was drawn on more freely at certain seasons of the year than had formerly been the case, and this led to the complaint. (211 N. Y. S. 338.)

Power Company Held Liable for Damages from Service Failure When Failure Could Have Been Anticipated.—In Curry vs. Norwood Electric Light & Power Company the St. Lawrence County (N. Y.) Court held that the power company was liable for damages to an operator of a motion-picture theater when the service failure was not due to an act of God or an inevitable accident. The company's hydro-electric plant was situated below that of a paper company which closed its dam gates on December 24 and greatly reduced the water flow in the river. The company's steam-reserve plant was not able to maintain service to the theater, and the court held that such conditions should have been foreseen. It further held that though the company had notices posted at its plant and offices stating that it did not guarantee continuous service, it had not made such a rule part of a written contract or published it to its customers, and therefore it was not binding. (211 N. Y. S. 441.)

Manufacturing and Markets

Trade Policy of the Electragists*

Analysis of Financial Status of the Contractor-Dealer and His Position in the Flow of Goods—Establishment of Trade Policy Depends on Outlet Furnished by Contractor-Dealer

BY O. FRED ROST
President Newark Electrical Supply Company, Newark, N. J.

THE trade policy recently adopted by the Association of Electragists International states that distribution in the electrical industry should be from manufacturer through jobber through contractor and dealer to consumer.

This resolution gives expression to a tendency which is by no means new within the realm of co-operative effort in our industry. But it specifically states that the ideal channel of distribution would leave the members of this association in direct contact with the jobber only. It will be well to face squarely the obstacles which oppose immediate enforcement of the policy which this resolution proclaims.

However, where I, a jobber, am talking to you as electragists, as electrical contractors and dealers, I am sure that for the moment I am justified in not elaborating upon that step of distribution which concerns itself with the relationship between manufacturers and jobbers.

Possibly I might be accused of being discourteous when in support of my contentions I present statistics reflecting on the status of members of this organization. But you will grant that the status of any man or concern in business and the degree of success with which a business is conducted always are reflected with an unusual degree of accuracy in the financial standing of the party involved and the manner in which bills are paid. It does not seem entirely out of place, therefore, that we should examine into the capacity of the members of your association to support the principles so pronounced.

CREDIT CONDITIONS

By way of explanation of the figures I am about to quote, I wish to say that I have taken the list of association members for the entire United States and ascertained through the usual channels the credit standing which they enjoy. Please bear in mind that these figures apply to the entire United States and must therefore be considered as reflecting actual conditions with a fair degree of accuracy.

Of the entire membership 7½ per cent have a first-class credit rating and appear to be well financed to take care of all the business they take. Twelve per cent enjoy a good credit rating, are reputed to pay their bills with reasonable promptness and would be considered a good credit risk by almost every business house. The rest, comprising 80 per cent, divides itself into classes of those who are fairly satisfactory, doubtful, or unsatisfactory. These figures apply only to members of this association, and represent approximately only 10 per cent of the total number of contractors and dealers actually doing or attempting to do business in the United States.

I am sure, however, that this trade policy is meant for the contractor-dealer branch of the industry as a whole. Therefore, in order that we may get a picture of what would happen if this trade policy were put in effect to-day, we should consider total figures for the entire country, including all contractors and dealers on the one hand and figures including all the jobbing houses on the other.

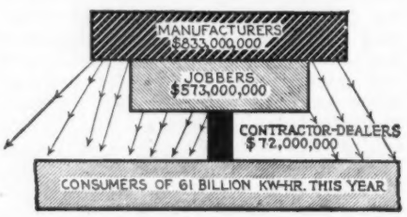


CHART ILLUSTRATING CHANNELS THROUGH WHICH BUSINESS FLOWS

According to the most recent available statistics, there are approximately 3,500 manufacturers of various electrical products. There are approximately 680 jobbers. There are 24,300 contractors and contractor-dealers. That means that in numbers this trade group is quite amply represented. But unfortunately numbers alone do not count.

Let us be liberal and grant that each of these contractors or dealers represents a working capital of $1,000. This gives us a total of $24,300,000 as representing the working capital of the contractor-dealer branch of the industry. This figure is, of course, approximate. More accurate figures are available for the jobbing branch and show an invested capital of about $100,000,000.

If, then, we were to decide that this established trade policy is to be enforced at once, we would face the practically impossible situation of having to find some way by which the jobbing branch, with an invested capital of approximately $100,000,000, is to exist and thrive on whatever business can be developed by the contractor-dealer branch with an invested capital of slightly over $24,000,000.

Let us consider the problem from another standpoint. Manufacturers of all classes of electrical material produced in the year on which I have statistics a total of $833,000,000 worth of goods. Jobbers during the same period did a business of approximately $573,000,000.

Under this pronounced trade policy the flow of goods to the consumer should be through contractors and dealers. There are 24,300 reported in this line of business. We have conceded to them a working capital of $24,000,000. Even if they turned their working capital six times a year, they can take care of only $144,000,000 worth of business. Then, we must remember that approximately one-half of the business volume of the contractor represents labor, so actually on the basis of a $1,000 capital and a six times per year turnover, contractors can handle about $72,000,000 in merchandise.

With these figures before us, let us see on the accompanying chart what the result will be if we carry out this trade policy. The base of this chart represents the vast army of consumers which it is estimated accounts for a total of 61,000,000,000 kw.-hr. this year. Serving them is the contractor-dealer branch with $72,000,000 capacity. Next come the jobbers with $573,000,000 capacity. Next come the manufacturers with $833,000,000 capacity.

You must grant me that unless we could find some way of overcoming all this precarious and unbalanced condition the entire industry would topple over in the same way in which this inverted pyramid would fall from sheer lack of support. The fact that disaster has not come and that the public and the consumer have been served in some way or other is due entirely to the direct communication which necessity established between manufacturers and jobbers on one side and the consuming public on the other, as shown by the arrows.

However, granting that the channels of distribution as outlined in this pronounced trade policy are logical when we apply them to the conditions in the industry as found today and as reflected in this chart, it must be readily admitted that we would be attempting the impossible if we tried to force $833,000,000 worth of goods per annum through outlets with a seventy-two-million-dollar-per-annum capacity.

SYMPATHY OF INDUSTRY

We all know that in the past the greater number of contractors and dealers have not been able to function properly. I have endeavored to show some of the basic reasons for their failure to function satisfactorily. The manufacturer and the jobber, in obedience to the first law of nature—self-preservation—have had to maintain di-

*From a paper presented at the convention of the Association of Electragists International at West Baden, Ind., September 23-25, 1925.

rect contact with the consumer, and through that direct contact they have managed to survive in business. But has it occurred to you that those consumer sales—or call them what you will—to a considerable extent, have nevertheless enabled the jobber to absorb the tremendous losses which the failures of the contractor and dealer group imposed upon him?

Of course, there are still many jobbers who are not yet in sympathy with what the contractor is trying to accomplish. But I believe that there is no thinking jobber who would not like to see this pronounced trade policy 100 per cent in operation and recognized by 100 per cent of his competitors. However, where the inherent instinct for self-preservation cannot be disregarded, no matter how much a jobber desires to co-operate 100 per cent with this pronounced trade policy, he can only co-operate to the degree in which the members of this trade group can uphold their own end of the bargain.

The jobber has a huge investment in capital on which he has a right at least to earn interest. He has large organizations to maintain. In order properly to perform his function he must co-operate with manufacturers in securing distribution for their wares. He has countless and important responsibilities which he must continue to carry, regardless of from whom he secures the business which enables him to live.

If the contractors and dealers expect their local jobbers to abandon certain direct consumer business, they must at the same time be prepared to give that jobber their business in exchange for the loss. This is one factor which I plead with you to keep in mind, because it is the rock upon which more than one plan of co-operation has been wrecked—this lack of willingness to give and take results, in lack of proper realization that any scheme, in order to work successfully, must provide that all parties concerned are taken care of with the same degree of fairness.

The problem then is to increase the contractor-dealer's capacity for service so that thereby this narrow column, which at present acts like the neck of a bottle and obstructs the free flow of merchandise in accordance with your trade policy, will gradually be widened. You as a group provide at present only a narrow, in many ways inefficient and certainly most insufficient point of contact between the consuming public and electrical merchandise. As that channel is widened, so will the flow of merchandise through it automatically increase.

The necessity for the jobber to maintain direct contact with consumers will be eliminated in direct proportion to the degree with which the contractor-dealer is prepared to assume the responsibility.

Supreme Court Closes Maple Flooring and Cement Cases

The United States Supreme Court on October 12 refused to grant a petition for a rehearing filed by the government in the Maple Flooring Manufacturers' Association and the Cement Manufacturers' Protective Association cases. This action definitely closes the proceedings. It was in these two cases, decided against the government, that the Supreme Court last spring laid down its important decisions defining legal and illegal trade association activities, particularly with reference to the collection and dissemination of statistics, and thereby removed the uncertainty which has surrounded such association work for several years.

Immediately after the decision in the spring, the Department of Justice announced that it would accept the principles laid down by the court, but would move for a rehearing in these specific cases on the ground that the evidence showed that the two associations had committed illegal acts within the principles announced by the court. The court evidently took the contrary view of the matter.

Engines and Waterwheels

Amount and Value Increasing, but Number of Manufacturers Classified in Industry Is Declining

THE number and value of engines and waterwheels manufactured in the United States increased between 1914 and 1919 and between 1921 and 1923, according to the census of manufactures of the Department of Commerce, but the number of establishments classified in this industry has declined from census to census. There was a decrease from 296 in 1921 to 249 in 1923, a net result of the loss of seventy-two establishments and the addition of twenty-five.

Of the seventy-two establishments lost to the industry, twenty-four had gone out of business prior to the beginning of 1923, eighteen were idle during the entire year, twenty-six were engaged primarily in the manufacture of engines or waterwheels in 1921 but reported other commodities—agricultural implements, motor vehicles, foundry and machine-shop products, etc.—as their principal products for 1923 and were therefore classified in the appropriate industries, and four reported products valued at less than $5,000 in 1923. Statistics were limited to establishments reporting products valued at $5,000 or more. The term "engines and waterwheels" includes steam engines (other than locomotives) and turbines, internal-combustion engines of all kinds, tractors and traction engines, and water turbines and motors. Engines made for installation as parts of complete motor vehicles or other machines manufactured in the same establishments are not treated as products of the engine industry.

During 1923 the number of people engaged in the industry was 57,740, the cost of materials (including also fuel and mill supplies) was $124,543,051, the value of the products manufactured was $266,997,778, and the primary horsepower—that is, the total rated horsepower capacity of equipment producing power used in manufacture—was 165,137. The complete statistics will be found in the bulletin issued by the Department of Commerce.

Business Conditions

ACTIVITY in the electrical industry is reported from nearly all sections of the country. In some territories the number of small orders placed for motors, control equipment and general supplies has been very large. Much activity in outdoor substation work is noted, and there is evidence that many orders for switching equipment will be placed this winter. Negotiations under way for building a tie line between properties in Pennsylvania will, when consummated, require a large amount of such apparatus.

Textile plants in the Southeast are showing more activity, but those in New England are not purchasing as well. A 500-kw. rotary carbonizing furnace was reported sold to Dodge Brothers, Inc., and, in general, electric furnace equipment is in good demand. The General Electric Company announced that orders for the third quarter ended September 30 amounted to $75,561,483, which compares with $58,389,832 for the same quarter of 1924, an increase of 26 per cent. Sales of that company for the first nine months of 1925 are 10 per cent higher than for the same period last year. Steel activity shows an upward trend with an increasing volume of business as well as production.

In New England several large orders were placed for power equipment, motors, control apparatus and switches. Transmission-line supplies are in good demand in that district, and several negotiations are under way for good-sized orders of line equipment. Building operations continue to be an important factor in holding up the volume of business. Nearly $5,000,000 has just been appropriated for construction work by the New England Telephone & Telegraph Company. Sales in the New York district are in encouraging volume. A large manufacturer reports a considerable total increase in small orders for general-purpose motors and control equipment, aggregating a large volume. There is an increasing demand for small motors for household appliances, and sales of switching equipment and transformers are very active.

No large power-equipment orders have been placed so far this month, but some good business is in prospect. In the Southeast business is active and industrial plants are purchasing. A textile company placed an order for motor equipment for electrification amounting to approximately $20,000, and the outlook is good for further similar orders from other companies. An expansion of business is predicted for the Middle West. Several sizable contracts have been let in that territory for construction work, and there is a good demand for distribution and switching equip-

ment. On the Pacific Coast the volume of sales is holding up well. Continued purchasing of motors for pumping plants indicates an increased purchasing power in the farming districts.

Largest September Building Contracts on Record

THE largest September building record and the second largest month on record—this is the F. W. Dodge Corporation's report for construction work started last month. Building and engineering contracts awarded in the thirty-six Eastern States, which include about seven-eighths of the total construction volume of the country, amounted to $548,216,700. This was only 7 per cent under the high record figure of August, and it represented a 59 per cent increase over September of last year. A seasonal decline of about 7 per cent is customary in September. The month's record included the following important items: $250,417,000, or 46 per cent of all construction, for residential buildings; $80,171,800, or 15 per cent, for commercial buildings; $79,668,000, or 15 per cent, for public works and utilities; $43,297,700, or 8 per cent, for industrial buildings, and $35,217,300, or 6 per cent, for educational buildings.

Contemplated new work reported for these states last month amounted to $661,397,100, a decrease of 19 per cent from August, but a 54 per cent increase over September of last year. September construction contracts in Texas, which is not included in the above, amounted to $18,252,800. The September contracts for the various divisions listed in the thirty-six Eastern States are as follows: New England, $47,636,800; New York State and northern New Jersey, $130,375,500; Middle Atlantic States, $48,482,600; Southeastern States, $85,282,300; Pittsburgh district, $66,314,800; the Central West, $160,651,800, and the Northwest, $9,472,900.

Copper and Zinc Prices Advance —Sales in Good Volume

BOTH copper and zinc have advanced in price, with zinc probably firmer at the higher price than copper, though no disposition to shade the price of the latter has been manifested by producers. The lead market is steady with purchases on a good scale at 9¼ cents New York and 9¼ cents St. Louis. Tin also advanced sharply. After declining to 14.375 cents delivered a week ago, copper is back at 14⅝ cents, at which figure a substantial business has been done since Monday at normal freight rate points. One small lot for Western delivery brought 14¾ cents.

Consumers in this country are using metal at a high rate, and all that seems necessary to strengthen the market is for Europe to resume buying on a reasonably large scale. Manufacturers of lead-covered cable continue to be extremely active buyers, with battery makers and manufacturers of "blue" lead products also large buyers. The zinc situation is more than satisfactory to producers, prompt metal being in particular demand and supplies being limited.

NEW YORK METAL MARKET PRICES

	Oct. 7, 1925 Cents per Pound	Oct. 14, 1925 Cents per Pound
Copper, electrolytic	14⅜	14⅜
Lead, Am. S. & R. price	9¼	9¼
Antimony	17½	17½
Nickel, ingot	33-34	33½
Zinc, spot	8.35	8.60–8.62½
Tin, Straits	60⅞	62½
Aluminum, 99 per cent	28	28

Base copper price Oct. 14, 1925, 16½ cents

Expansion of Business Predicted for Middle West

EXPANSION of business in the Middle West is predicted on all sides for the next few months. Large wholesale organizations are in an optimistic frame of mind and excellent business seems just ahead. The employment situation shows an improvement in industrial conditions. The Illinois Free Employment Service did the largest month's business since October, 1923. Various utility companies have been very busy, several sizable contracts for construction work having been placed. There has been a good demand for switchboard recording-type ammeters, distribution and switching equipment. Appliance sales have been very good, and many of the jobbers are buying their holiday requirements at this time. Sales of heavy-duty ranges are so far considerably in excess of those made last year.

Several Large Orders Placed in the New England District

A PROMINENT manufacturer in New England reports the receipt of several large orders, which include one for power equipment for Providence and others for large-lot shipments of small motors, control apparatus and switches. In addition, negotiations have been closed for a 2,100-kva. waterwheel generator by the same manufacturer. Transmission-line supplies are in good demand and central-station companies apparently are stocking up in general supplies. One company records much activity in this line and reports several negotiations under way for good-sized line-equipment orders. Electrical supplies for new building construction continue to be a prominent feature in the industry. Building operations are an important factor in holding up the volume of business. A manufacturer of industrial electric trucks reports increasing interest in this line and records a number of sales of recent date; in addition, electric welding equipment is attracting much attention.

Oil burning equipment and electrical refrigeration units are in steady demand. A group of fourteen central-station companies records sales in domestic appliances for the week ended Oct. 3 in excess of about 27 per cent over those of the corresponding week last year. This same group also shows a gain of over 43 per cent in the volume of business to date for 1925 as compared with the same period in 1924. The leather industries, according to recent surveys, are showing increased activity throughout the district. Textile industries, on the other hand, are as yet far below their normal business stride.

Volume of Sales Holding Up Well on the Pacific Coast

BUSINESS is in fine volume on the Pacific Coast, but without any very large orders. Power-company purchasing includes many pole-line-hardware orders in from 2,500-piece to 15,000-piece lots, the San Joaquin district being particularly well represented. Among other inquiries and orders are four carloads of clay conduit and 1,500 cross arms. Railroad business is also good and covers considerable galvanized conduit and roughing-in material and construction tools. Industrial business was rather quiet, but included several assortments of externally operated switches both for factories and for incorporation in pumping plants. Sales of motors of from 5 hp. to 10 hp. for pumping plants have held up surprisingly well for this time of year and furnish definite proof that the purchasing power of about four to five years ago is being gradually restored to California farmers. Contractors are active buyers. Sales of illuminating equipment are good and several large orders are in prospect. Large sales of ranges are reported for the Seattle district. One company has sold 4,000 to date this year and expects to sell at least 1,000 more by the end of this year.

Motor and Transformer Sales Good in the New York District

THE volume of business transacted in the New York district so far in October is reported by manufacturers as very encouraging. Sales of motor and control equipment to contractor-dealers have been in particularly good volume. The demand for small motors for household appliances, especially for washing machines and electric refrigerators, is almost 100 per cent greater than for the same period last year, according to a large manufacturer.

Transformer sales have been active, all manufacturers reporting the receipt of good orders. Central-station companies have been purchasing power transformers. An industrial sale covered 3,450 kva. of that apparatus, another industrial prospect will require about 3,000 kva., and there are several orders pending that are quite large. Switching equipment is moving well and inquiries are good. One manufacturer reports the sale of approximately $30,000 worth of 132,000-volt motor-operated switches. Various central-station companies in this district are considering much outdoor substation activity, and a contemplated tie line in Pennsylvania is expected to create a good demand for that class of equipment.

Business Active in the Southeast —Industrial Plants Buying

CONDITIONS throughout the Southeast continue to show an underlying favorable trend, and recent reports from nearly all lines of business show increased volume of sales during September as compared with the same month last year. One of the larger electrical jobbers reports his increase in sales at 20 per cent. A survey by the Crop Survey Department of Georgia places the Georgia cotton crop

this year at slightly over one million bales, which is an increase over the 1924 crop. This increase will come mainly from middle and southern Georgia. Textile companies, reported as showing signs of activity last week, are coming more into prominence, and one order for motor equipment for electrification amounting to about $20,000 has already been placed. Small-motor sales are also showing improvement.

Central-station companies are placing a reasonably satisfactory volume of orders for outdoor-oil-switch equipment and for remote-control-switchboard equipment, while a number of inquiries from industrial firms for steam turbines are also reported. Distribution transformers and watt-hour meters are in active demand. Supply business is good, with the exception of the territory in north Georgia and parts of South Carolina. Florida continues as heretofore to furnish the bulk of orders in this line. Fans, which have seen the most active season in years, continue their movement, one jobber reporting an order for $20,000, covering a supply of fans for a large hotel. A slight improvement in the general curtailment of day power is in sight as the Georgia Railway & Power Company expects to put into operation soon a 10,000-kw. unit at its new Yonah development.

Activities of the Trade

Westinghouse Company's New Executive Organization

The two new vice-presidents of the Westinghouse Electric & Manufacturing Company, E. D. Kilburn and W. S. Rugg, whose election was announced by President E. M. Herr last week, and the news of which appeared in the ELECTRICAL WORLD of October 10, have been charged with the following duties, according to a statement by F. A. Merrick, vice-president and general manager: W. S. Rugg will take over the direction of the engineering activities of the company, and E. D. Kilburn, as vice-president and general sales manager, will direct the sales activities as arranged by the vice-president and general manager, F. A. Merrick. Mr. Kilburn will retain his office of vice-president of the Westinghouse Electric International Company. Dean K. Chadbourne will succeed Mr. Kilburn as general manager of the International Company.

Vice-President H. D. Shute, aside from the direct operation of the sales department, which will be handled by Mr. Kilburn, will retain his direction of the broad commercial activities of the company, including especially customer relationships. Vice-president H. P. Davis, formerly in charge of engineering and manufacturing activities as applying to the strictly electrical portions of the company's business, will have direction over the entire manufacturing activities of the company and in addition will have direction of the general features of the radio business, including broadcasting. The duties of the other vice-presidents of the company remain practically unchanged.

Servel Closes Large Contract with Brecht Company of St. Louis

The Servel Corporation, 51 East Forty-second Street, New York, has entered into a contract with the Brecht Company of St. Louis, large manufacturer of butchers' showcases and boxes and an important factor in that business, to equip all that company's products with Servel refrigerating apparatus exclusively. The contract calls for a minimum delivery of $500,000 of refrigerating machines, at the contract price, during the year 1926, and covers a greatly increased amount during 1927 and 1928.

Bohn Refrigerator Establishes Electric Refrigeration Branch

The Bohn Refrigerator Company, St. Paul, through George Von Nieda, vice-president, announces the appointment of Charles W. Nye as managing engineer in charge of the department of electric refrigeration. Mr. Nye has had extensive experience in the design of metal products especially for porcelain enameling and in heating, ventilating and other mechanical devices. This department will co-operate with manufacturers and distributors of mechanical units.

Delta-Star Electric Company Adds to Plant Facilities

The Delta-Star Electric Company, 2400 Block, Fulton Street, Chicago, is completing a new steel-fabricating plant, a galvanizing plant and a high-voltage testing laboratory. The company has purchased the entire block between the present plant and the Pennsylvania and Belt Line Railroads. The increasing use of steel in outdoor substations has placed such a heavy demand upon the equipment of the old plant of this company that it was decided to move all this work into a new building and to add equipment for completely fabricating the substation structure. The fabricating plant is 100 ft. x 300 ft. and 60 ft. high. It is equipped with a 25-ton overhead traveling crane made by the Milwaukee Electric Crane & Manufacturing Company and four 1-ton Shepard "Lift-about" hoists. The latter are used for handling steel in the vicinity of the punches, presses and shears. The new fabricating plant will permit the manufacture of a complete substation on a production schedule. A hot-galvanizing plant is located adjacent to the fabricating plant. The company has also announced the establishment of net prices, on its unit-type, steel-tower outdoor substations, which took effect October 15, and will remain in force until March 15, 1926.

The high-voltage testing laboratory, now being equipped for 750,000 volts and later to be equipped for 1,500,000 volts, is housed in a building adjacent to the old plant. In addition to electrical testing equipment the laboratory is provided with mechanical testing machines for putting insulators and equipment under strain during test. The transformer and synchronous motor equipment for the laboratory is being furnished by the Westinghouse Electric & Manufacturing Company, the principal measuring instruments by the Weston Electrical Instrument Corporation and a switchboard by the Delta-Star company. The fabricating plant was designed by and built under the supervision of the Austin Company.

General Electric Orders for Third Quarter Show Increase

Gerard Swope, president of the General Electric Company, has announced that orders received by the company for the three months ended September 30 amounted to $73,561,483, compared with $58,389,832 for the same quarter in 1924, an increase of 26 per cent. For the nine months of the present year orders total $223,876,711, compared with $203,097,719 for first nine months of 1924, an increase of 10 per cent.

Davidson, N. E. L. A. President, Enrolls in Kelvinator Institute

On September 1 J. E. Davidson, president of the National Electric Light Association, formally enrolled in the Kelvinator Institute, a training school conducted for salesmen by the Kelvinator Corporation. The institute offers thorough and comprehensive training in everything pertaining to domestic electric refrigeration from both mechanical and merchandising angles. "Needless to say," writes Mr. Davidson in commenting on his action, "my motives are purely personal. I have watched electric refrigeration move year by year into a more prominent place in the central-station picture. When the landslide of demand by the public and the concentrated educational advertising of manufacturers made its appearance late in 1924 and early this year, it became apparent that a lusty youngster had at last grown up. Investigation reveals that there are several systems on the market that look mechanically 'O. K.' and which appear adequately financed. This means that the central-station company can have confidence in looking toward refrigeration as an aid to building up domestic load. I believe that the time is ripe for more active but still careful effort to be put behind refrigeration by the central stations.

"My reasons for joining the Kelvinator Institute can be stated very simply. It is going to be very necessary for central-station men to acquire the specialized knowledge of merchandising, servicing, installation and similar subjects requisite in the business of selling any appliance. I know of no better way to learn than to take advantage of the experience of others who have successfully gone through the initial difficulties found in every

new industry." Mr. Goss in commenting on Mr. Davidson's action said that it was the most significant happening of the year to the electric refrigeration industry.

"We have worked hard to put electric refrigeration on a solid foundation," he said. "We have been looking forward to the time when even the most conservative public-utility concerns would acknowledge that the time was ripe to give their support. The action of an authority such as Mr. Davidson is naturally most gratifying and leads us to believe that we have not worked so hard in vain."

The George J. Hagan Company, 1301 Chamber of Commerce Building, Pittsburgh, has received an order from Dodge Brothers, Inc., for a 500-kw. rotary carbonizing furnace, a duplicate of two installed in that plant two years ago.

The Wagner Electric Corporation, St. Louis, announces the appointment of A. H. Ellerman to the staff of the Kansas City office.

The Western Electric Company reports that orders received during the month of August amounted to $27,775,000. Orders received during the first eight months of 1925 amounted to $196,738,000, which was $2,154,000 less than for the first eight months of 1924.

The Bates Expanded Steel Truss Company, Chicago, through the Bishop Sales Corporation of Montreal, has received an order for steel towers and expanded channel H-frames from the Donnacona Paper Company of Quebec, for the construction of a 35-mile, 66,000-volt, double-circuit transmission line to serve that company's mills at Donnacona, Quebec.

The Servel Corporation, 51 East Forty-second Street, New York, has issued its new price list, effective October 1, 1925, covering its domestic and commercial refrigerating equipment. Under domestic equipment the company offers, in addition to its standard line of machines and refrigerators, four special models using the same machines as the standard line but attractively priced.

The Westinghouse Electric & Manufacturing Company, in addition to the suit brought against the Scintilla Magneto Company of New York last week upon a Harris patent relating to large circuit breakers, has instigated another suit against the Scintilla company in the United States District Court for the Southern District of New York for alleged infringement of three patents relating to the electric and automotive industry. The Scintilla company has just been purchased by the American Brown-Boveri Electric Corporation.

The National Carbon Company, Inc., carbon sales division, Cleveland, announces that in order to eliminate the confusion that might result from the use of several systems of designing lubricated brushes, it has decided to indicate all lubricated grades by a suffix numeral which indicates the type of lubrication. The various systems of designation now used have come into being owing to the affiliation of other companies with the National Carbon Company. The new designation will be put into effect on January 1, 1926, but any new specially lubricated grades which may be developed between now and that time will use the new system of designation.

The Pittsburgh Transformer Company, Pittsburgh, announces that R. W. Piper, formerly in the Pittsburgh sales office, has taken charge of the Atlanta office temporarily, following the resignation of the former manager, who has entered the real estate business in Florida.

The Pettingell-Andrews Company, Boston, electrical jobber, announces that its general offices are now in the company's new building at 378 Stuart Street.

The Monitor Controller Company, Baltimore, announces that is has developed a railway mounting for its "edge-wound" resistor units, a nickel-copper alloy ribbon wound on edge in helical form and mounted on a steel-reinforced porcelain support which passes through the entire length of the unit. One of the chief features of the railway mounting is a special form of terminal clamp supported by the end rods composing a part of the resistor mounting, which is entirely of steel.

Rathbone-Sard & Company, Inc., Aurora, Ill., announce that T. E. Downs, formerly in the appliance department of the Puget Sound Power & Light Company, Seattle, succeeds T. A. Marden as manager of the Washington district, handling the distribution of its "Acorn" electric ranges.

The Edison Electric Appliance Company, Inc., 5600 West Taylor Street, Chicago, announces that it has produced a new 6-lb. laundry iron equipped with the "Hotpoint" sheath-wire unit. The company also announces the production of some new low-priced percolators and percolator sets.

The Naugle Pole & Tie Company, 59 East Madison Street, Chicago, announces that it has opened an office at 709 New Call Building, San Francisco, in charge of J. Barclay Naugle, formerly Western sales manager.

The Westinghouse Lamp Company has taken out a permit to proceed with the construction of an addition to its plant on Arlington Avenue, Bloomfield, N. J., 52 ft. x 100 ft. and 50 ft. x 93 ft., to cost about $100,000. Stone & Webster, Inc., 147 Milk Street, Boston, are the engineers.

New Equipment Available

Utility Truck

A public service utility truck, which consists of a tarpaulin-covered body with many compartments for carrying tools and supplies, earth-boring auger and derrick for setting poles, and which is mounted on a four-wheel-drive truck, has been developed by the Four Wheel Drive Auto Company, Clintonville, Wis., which company also manufactures the "FWD" earth-boring and pole-setting equipment, a machine built for heavy line-construction work. The chassis is the standard 3-ton "FWD" chassis somewhat modified. The new outfit is being built for the Western Electric Company and the American Telephone & Telegraph Company.

Six-Pole Safety "Disconnect"

A six-pole safety disconnecting switch, manually operated and remotely controlled, with two switch units per phase so as to disconnect both sides of the oil switch with one operation, has been placed on the market by the Delta-Star Electric Company, 2400 Block, Fulton Street, Chicago. The switch is opened and closed by a 180-deg. movement of a spade handle, which can be placed at any convenient point and operated through interconnecting pipes, bell cranks and levers.

The handle automatically locks in both open and closed positions, and the switch cannot be operated until a key is inserted in the lock and turned. An auxiliary switch attached to the lock connects to the oil-switch-tripping circuit. When the key is turned the oil switch opens, making it impossible to open or close the disconnecting switch under load. This switch is designed for service on an isolated phase bus, with phases spaced 14 ft. in a vertical plane. Adjustable compression springs with operating mechanism give a balanced operating movement, permitting the switch to be easily opened or closed.

New Centrifugal Drive

A new type of drive for centrifugal extractors in chemical and other industries, but designed particularly for use in sugar mills, has been announced by the General Electric Company. The motor used in the new drive, a special form of the General Electric "KTR" type, is a high-torque squirrel-cage machine with the high-resistance portion of the rotor winding built in the form of a fan and placed at the top of the motor. The heated air developed is thus expelled without passing through the motor proper.

To obtain adjustments in acceleration and speed the motor is operated at the required voltages from an auto-transformer serving a number of motors. Two sets of buses are run from the auto-transformer, one for accelerating and the other for discharging and top-speed operation. The motor is accelerated from the high-voltage bus, and when top speed is reached a current-limit relay automatically changes the motor connections from the high-voltage to the low-voltage bus. With this type of drive the advantages of a direct-coupled squirrel-cage motor are obtained, combined at the same time with great flexibility in torque and speed characteristics. Power factor and efficiency over the complete cycle of operation are said to be very high.

New Trade Literature

MAGNETIC CLUTCHES. — Publication P-11, entitled "C-H Magnetic Clutches," issued by the Cutler-Hammer Manufacturing Company, Milwaukee, describes and illustrates many uses for these clutches on synchronous-motor drives where the starting is severe, as in cement, flour, paper and steel plants. It contains many working data and describes the principal features of the "C-H" magnetic clutch. A chapter is devoted to the proper selection of a clutch and a table gives the ratings for the various sizes.

BAKELITE. — "What Bakelite Service Means" is the title of a folder issued by the Bakelite Corporation, 247 Park Avenue, New York City, which contains a short sketch relative to the development and manufacture of "bakelite" products. A number of illustrations are given showing some of the scientific apparatus used for testing purposes in the company's research laboratories.

ROTOR SPRAY.—Bulletin No. 29 issued by the Hardinge Company, York, Pa., describes and illustrates the Hardinge rotor spray for gas scrubbing, air conditioning, absorption, concentration, mixing, aëration, heating and cooling. It contains illustrations showing various applications of the rotor spray, calls attention to its advantages, and gives a list of uses for the rotor spray.

ELECTRICAL APPLIANCES.—Landers, Frary & Clark, New Britain, Conn., is distributing a new catalog covering its "Universal" electrical household appliances, heating devices, table appliances, table stoves, portable ranges, vacuum cleaner, irons, etc.

CONVEYING MACHINERY.—The Freeman-Riff Company, Terre Haute, Ind., has issued a bulletin describing the coal handling, weighing and storing equipment at the new power plant of Purdue University, Lafayette, Ind., which was designed, manufactured and installed by the company.

CONDUIT AND FITTINGS.—The American Wiremold Company, Hartford, Conn., has issued catalog No. 10, which is a catalog and wiring guide for the Wiremold conduit system. It contains sixty-three pages and is divided into two sections. Section 1 covers the No. 500 Wiremold conduit and fittings; section 2 describes No. 700 Wiremold conduit and fittings, bender, enamel, specialties and "Wireduct" guaranteed loom.

PERCOLATORS.—A folder distributed by the Edison Electric Appliance Company, Inc., 5600 West Taylor Street, Chicago, calls attention to the new models of its "Hotpoint" percolators, including the "Dolly Madison," "Revere," etc., and also a percolator set.

RENEWABLE FUSES. — A pamphlet issued by the Chicago Fuse Manufacturing Company, Laflin and Fifteenth Streets, Chicago, covers the ferrule contact and knife-blade contact "Union" renewable fuses.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

Purchase is desired in Alexandria, Egypt (No. 17,205), of electric automobiles.

An agency or purchase is desired in Singapore, Straits Settlements (No. 17,218), for electrical appliances and radio sets and parts.

Purchase and agency is desired in Traiguen, Chile (No. 17,217), for lamps, flashlights and batteries and lamps for pocket flashlights.

Purchase is desired in Sydney, Australia (No. 17,247), of electric vacuum cleaners for electric and steam railway cars.

Purchase is desired in Caracas, Venezuela (No. 17,219), of wiring materials, telephones, buzzers, flashlights, fans, motors, generators, therapeutic apparatus, switches, insulators, wire, etc. Purchase or agency is desired (No. 17,241) for engines and boilers.

CABLE AND ACCESSORIES FOR MELBOURNE, AUSTRALIA.—Separate tenders will be received by the Victorian Electricity Commission, Australia, until Nov. 9 for a supply of three-core cable and accessories for 22,000 volts for the Yallourn power scheme and for lead-covered and armored cable for 6,600 volts.

TELEPHONE EQUIPMENT FOR MELBOURNE, AUSTRALIA.—Tenders will be received by the Postmaster General's Department, Melbourne, Australia, until Nov. 17 for magneto automatic junction material (Schedule C 491). Tenders will also be received until Nov. 10 for telephone receivers and associated parts (Schedule C 46).

STEEL TRANSMISSION-LINE SUPPORTS FOR NEW ZEALAND.—Tenders will be received by the Public Works Department, Wellington, N. Z., until Dec. 8 for furnishing about 170 galvanized-steel transmission line supports for the Waikato power scheme (Section 135).

CENTRIFUGAL SEWAGE PUMPS FOR CHRISTCHURCH, NEW ZEALAND.—Tenders will be received by the Christchurch (New Zealand) Drainage Board until Jan. 5, 1926, for furnishing and installing three electrically driven centrifugal sewage pumping plants.

WIRE AND CABLE FOR MONTEVIDEO, URUGUAY—Bids will be received by the Administracion General de las Usinas Electricas del Estado, Montevideo, Uruguay, on 96,000 meters of lead-covered copper conductor and 26,000 kg. of bare copper wire. Specifications in Spanish can be obtained on loan from the Electrical Equipment Division, Bureau of Foreign and Domestic Commerce, Washington, D. C., by referring to Nos. 184,503 and 184,501 respectively.

RUBBER-INSULATED WIRE AND CABLE FOR MONTEVIDEO, URUGUAY. —Tenders will be received by the State Electricity Supply Works, Montevideo, Urguay, until Dec. 22 for 200,000 meters of rubber-insulated wire and cable. Bids will also be received until Dec. 28 for 1,060,000 meters of special cable for outside use.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

BEVERLY, MASS.—The Beverly Gas & Electric Company has petitioned the Department of Public Utilities for permission to sell 11,000 shares ($25 par value) of capital stock, to be sold at $55 per share, the proceeds to be used for new construction and improvements.

DANVERS, MASS. — A committee has been appointed by the Merchants' Association to investigate the proposal to install an ornamental lighting system on Danvers Square and several of the adjoining streets.

READING, MASS. — The question of enlarging the municipal electric plant or purchasing electricity from some outside source to meet the increasing demand for electrical service is under consideration by the Municipal Light Board.

Middle Atlantic States

ALMOND, N. Y.—The New York Central Electric Corporation, Perry, plans to extend its transmission line to this section to supply electric service.

BINGHAMTON, N. Y.—Permission has been granted the Binghamton Light, Heat & Power Company to extend its transmission and distribution lines to serve the town of Colesville. A line will be erected from Binghamton to connect with the plant of the Afton-Windsor Light, Heat & Power Company at Center Village, recently acquired by the Binghamton company.

BUFFALO, N. Y.—The City Council is considering the installation of improved lighting systems on portions of Clinton Street, Elmwood and Lovejoy Avenues.

DENMARK, N. Y.—Plans are being considered by the Village Board for the installation of a street-lighting system throughout the village.

DE RUYTER, N. Y.—The Public Service Commission has authorized the Syracuse (N. Y.) Lighting Company to acquire the municipal electric plant and to erect the necessary lines to serve the village and town of De Ruyter and the towns of Cuyler and Truxton. The cost of the lines and distributing system, including the purchase of the plant is estimated at $50,250.

GLOVERSVILLE, N. Y. — The Fulton County Gas & Electric Company has petitioned the Public Service Commission to extend its transmission lines and distribution system to serve the villages of Esperance and Delanson and the town of Duanesburg.

GROVELAND, N. Y.—The Niagara, Lockport & Ontario Power Company, Buffalo, which is building a transmission line to Groveland, plans to extend its service to Livonia Center, Hemlock, Honeoye and Conesus, where street lighting has been contracted for as well as commercial service. In addition to the above the hamlet of South Livonia has petitioned for the establishment of a lighting district.

HERKIMER, N. Y.—Permission has been granted the Municipal Commission to extend the service of the municipal electric plant in the town of Herkimer and exercise a franchise granted by the Town Board.

LIMESTONE, N. Y.—A petition has been filed by the Niagara, Lockport & Ontario Power Company, Buffalo, for permission to erect a transmission line to and a distribution system in the village of Limestone.

LUZERNE, N. Y.—Permission has been granted the Adirondack Power & Light Corporation, Schenectady, to extend its electric system to serve the town of Luzerne.

NORTH TONAWANDA, N. Y.—The Wurlitzer Manufacturing Company, Cincinnati, plans to install electric power equipment in the proposed additions at its local piano plant, to cost about $175,000.

PAWLING, N. Y. — The Harlem Valley Electric Corporation has applied for permission to erect a transmission line and distribution system to serve the town of South East and to exercise a franchise granted by the Town Board.

ROCKWOOD, N. Y. — Plans are under way by Morrell Vrooman, 10 North Main Street, Gloversville, engineer, for a proposed hydro-electric power plant and transmission line in this vicinity, to cost about $400,000. Owner's name temporarily withheld.

SCHENECTADY, N. Y. — Work has started by the Adirondack Power & Light Corporation on the erection of a 33,000-volt transmission line, 33 miles long, between Spier Falls and Chestertown, to cost about $100,000. The construction of the additional 11-mile link between Chestertown and North Creek, which will probably be erected in 1926, will cost about $35,000 additional.

SYRACUSE, N. Y.—The City Council has authorized the installation of ornamental lighting systems in Harrison, South West and West Jefferson Streets.

TOTTENVILLE, N. Y.—The Public Service Electric & Gas Company, Newark, N. J., plans to install two submarine cable lines, to carry 36,000 volts, from its power plant at Perth Amboy, N. J., across Staten Island Sound to a local terminal for auxiliary power service for the Staten Island Rapid Transit system.

DOVER, N. J.—The Council has authorized the installation of an improved lighting system on Blackwell Street, from the viaduct to the river bridge, using 400-cp. units. The lamps will be installed by the New Jersey Power & Light Company.

HOBOKEN, N. J.—Steps have been taken by the merchants on Jackson Avenue for extension of the new lighting system on Jackson Avenue from its present terminus as far south as Armstrong Avenue.

HOBOKEN, N. J.—The Atlantic Tank & Barrel Corporation, Fourteenth and Madison Streets, plans to install electric power equipment in connection with the rebuilding of its plant, recently damaged by fire, with loss of about $250,000.

JAMESBURG, N. J.—The Council is negotiating with the Eastern New Jersey Power & Electric Company for extensions and improvements in the street-lighting system.

JERSEY CITY, N. J.—A permit has been granted the Public Service Electric & Gas Company, Newark, to build a switching plant and substation at the foot of Duffield Street, to cost about $100,000.

METUCHEN, N. J.—The Borough Council is considering the installation of an ornamental lighting system on Main Street, in the downtown district.

NEW BRUNSWICK, N. J.—The installation of new street lamps on Main and Jackson Streets is under consideration by the City Council.

PERTH AMBOY, N. J.—The Board of Aldermen has rejected bids recently received for an ornamental lighting system on Smith Street, and will soon ask for new bids. Petitions are also being considered for ornamental lamps on Brunswick and Hall Avenues.

ALTOONA, PA.—The Penn Central Light & Power Corporation, recently organized to take over the properties of the Penn Central Light & Power Company, contemplates extensions to the power stations and transmission lines.

RAYSTOWN, PA. — The United Light Company, Erie, has applied for permission to acquire the properties of the Raystown Water Power Company, and the Lewistown & Reedsville Electric Street Railway Company. Extensions in transmission lines are planned.

SAYRE, PA.—The installation of an ornamental lighting system in the business section is under consideration by the Borough Council.

SHARON, PA.—The extension of the ornamental lighting system on Sharpsville and South Main Avenues, to cost about $20,000, is under consideration by the City Council.

DOVER, DEL.—The installation of a new lighting system for Lockerman Street, to cost about $12,000, is under consideration.

BALTIMORE, MD.—The Summers Fertilizer Company, Stock Exchange Building, plans to install electric power equipment in connection with the proposed rebuilding of its plant on Fifth Avenue, recently destroyed by fire with loss of about $200,000.

LEONARDTOWN, MD.—William E. Cecil has applied to the Public Service Commission for permission to construct an electric power plant here.

RADFORD, VA.—The New River Development Company, a subsidiary of the Appalachian Power Company, Bluefield, W. Va., is planning to build a dam on the New River, 2 miles above Radford.

STRASBURG, VA.—The Shenandoah River Power Company, recently organized to consolidate a number of electric power utilities in this section, plans to erect transmission lines in Shenandoah, Rockingham, and Augusta counties.

North Central States

HOLLAND, MICH.—Extensions are contemplated to the municipal electric light and power plant, including the installation of generator, boilers, etc.

IONIA, MICH.—The Consumers Power Company, Jackson, is negotiating for the purchase of the Ionia Water Power Electric Company, and plans extension in its transmission lines in this district.

JONESVILLE, MICH.—The Southern Michigan Light & Power Company, Hudson, has acquired the local municipal electric plant.

BARBERTON, OHIO.—The Columbia Chemical Company plans to build a power plant, to cost about $200,000.

CINCINNATI, OHIO. — Plans for the proposed new lumber mill to be erected by the Huber Builder's Material Company, 713 Main Street, to cost about $150,000, include a power plant.

FULTONHAM, OHIO. — The Columbia Cement Company plans to install electric power equipment in the proposed addition to its local plant, to cost about $1,250,000.

LAKEWOOD, OHIO.—A permit has been granted the Cleveland Electric Illuminating Company to build an automatic transformer station, to cost about $94,000.

YOUNGSTOWN, OHIO.—Plans for the proposed Market Street development include the installation of an ornamental lighting system.

EVANSVILLE, IND.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Nov. 3 for the installation of an electric elevator, etc., in the United States post office and custom house at Evansville. For details see Searchlight Section.

EDWARDSPORT, IND.—Extensions and improvements are contemplated by the Interstate Public Service Company, Vincennes, to its local system, to cost about $1,400,000. A new outdoor substation is to be erected here to transform current for two 33,000-volt and two 66,000-volt transmission lines between Vincennes and the Edwardsport power station.

RUSHVILLE, IND. — Plans are under way for extensions and improvements in the municipal electric plant, including the installation of a new generating unit, etc. Charles Brossman, Merchants' Bank Building, Indianapolis, is engineer.

HAMMOND, IND.—The Standard Steel Car Company, Frick Building, Pittsburgh, plans to install electric power equipment in the proposed addition to its local plant, to cost about $200,000.

VINCENNES, IND.—Improvements are being made by the Interstate Public Service Company to its local system, to cost about $50,000. The work includes new buildings and equipment and improvements to the electric distribution system.

BLOOMINGTON, ILL.—A petition has been presented to the Board of Public Improvements asking for an ornamental lighting system for Harbord Drive from Maizefield Avenue to Oakland and on Maizefield Avenue from Oakland to Harbord Drive.

ELGIN, ILL.—Application has been made by the Aurora, Elgin & Fox River Electric Company to the Commerce Commission for permission to erect a transmission line to Udina.

INDUSTRY, ILL.—The Central Illinois Public Service Company, Springfield, has applied for permission to purchase the local electric system and to operate the transmission line from Macomb to Rushville.

QUINCY, ILL. — The General Radiator Company, Continental Bank Building, Chicago, plans to install electric power equipment in its proposed local plant, to cost about $250,000.

LA CROSSE, WIS.—Plans have been prepared by the Wisconsin Railway, Light & Power Company to erect a transmission line from North Bend to Ettrick, together with the installation of an electric distribution system in Ettrick.

DULUTH, MINN.—The Minnesota Power & Light Company plans to build a substation at Eighth Street and Garden Avenue.

WINONA, MINN.—Bids will be received by the City of Winona, care of G. W. Hoffman, recorder, until Oct. 1? for one electric generating unit with auxiliary equipment, to cost about $4,100; vertical single stage centrifugal sewage pumps with 15-hp. motor, to cost $4,500. E. E. Chadwick is city engineer.

MARSHFIELD, MO. — Permission has been granted the Missouri Electric Power Company to erect a 33,000-volt transmission line connecting Marshfield, Norwood, Mansfield, Ava and surrounding territories.

MOUND CITY, MO.—The Mound City Electric Light & Ice Company has been granted permission to erect a 13,200-volt transmission line through Holt County to serve rural consumers.

ROLLA, MO.—The Public Service Commission has granted the Ozark Public Service Company permission to erect a three-phase, 6,600-volt transmission line from Rolla to St. James.

MAPLETON, N. D.—Plans are under way to install an electric lighting system, for which bonds have been issued.

PORTLAND, N. D.—The Northern States Power Company, Minneapolis, plans to extend its transmission line here for local light and power service.

GURLEY, NEB. — The Western Public Service Company, Colorado Springs, Colo., plans to rebuild its transmission line from Dalton to Gurley, increasing the voltage 6,600 to 22,000.

OSCEOLA, NEB.—The Nebraska Gas & Electric Company, Omaha, is planning extensions to its transmission lines in this section.

HUTCHINSON, KAN.—A movement has been started by property owners on First Avenue to extend the ornamental lighting system from Main to Adams Street.

Southern States

ASHEVILLE, N. C.—The Electric Ice Company, Valley Street, plans to increase the output of its ice-manufacturing plant by about 60 tons per day.

HOOKERTOWN, N. C.—The local electric plant was recently destroyed by fire.

SEABOARD, N. C.—The Council is considering a bond issue for the installation of an electric light and power system.

DAWSON, GA.—The installation of a 200-kva. generator, direct-connected to a Corliss or uniflow type engine, and auxiliary apparatus, in the municipal electric plant is under consideration by the Council.

GAINESVILLE, FLA.—Bids will be received by G. H. Cairns, city manager, until Oct. 28, for one 450-hp. boiler, for the municipal power plant.

LA GRANGE, GA.—Plans are under way for the electrification of the local textile mills, operated by the Callaway interests, including the Unity Spinning Mill, Elm City Cotton Mills, Unity Cotton Mills, Hillside Cotton Mills and the Valley Mills.

LYERLY, GA.—The installation of an improved lighting system on a number of streets is under consideration by the Council.

MILLEDGEVILLE, GA. — The Georgia Southern Power Company, Mills Building, Washington, D. C., contemplates the installation of steam-turbo generating units and auxiliary equipment in its local plant, and also the erection of a transmission line across Hancock County.

BARTOW, FLA.—The City Council is considering the installation of an ornamental lighting system in the business section, to cost about $20,000.

BLOUNTSTOWN, FLA.—A power development on Ten-Mile Creek, about 10 miles from Blountsville, is under consideration by J. B. Halley & Company.

BROOKSVILLE, FLA.—Included in the plans of the Brooksville Farms Company for the creation of a modern town around the lakes and along the river, about 2 miles from Loacooche, is the development of a power site on the Withlacooche River in Hernando County.

FORT MEADE, FLA.—The City Council is considering a bond issue for extensions in the municipal electric light and power system.

FORT MYERS, FLA.—A committee has been appointed by the Chamber of Commerce to make investigations relative to the installation of an ornamental lighting system from the city to Fort Myers Beach. The preliminary plans provide for 130 lamps of 200 cp. each.

MADISON, FLA.—The municipal power plant has been acquired by J. D. Scruggs, Perry, and associates. The new owners plan extensions and improvements to the system.

ST. AUGUSTINE, FLA.—The City Council plans extensions in the electric lighting system in various parts of the city.

STUART, FLA.—A special election will be held on Oct. 27 to authorize an issue of $25,000 in bonds for the installation of a new lighting system.

TAMPA, FLA. — Contract has been awarded by the Tampa Electric Company to Stone & Webster, Inc., Boston, for the erection of a 66,000-volt transmission line to Mulberry and Winter Haven, a distance of 45 miles.

WAUCHULA, FLA. — Steps have been taken by property owners on West Main Street to extend the proposed ornamental lighting system to the western limits of Wauchula.

BIRMINGHAM, ALA.—A certificate of convenience and necessity has been granted the Alabama Power Company for the erection of a transmission line from Lock 18 on the Coosa River to points in west Alabama and a distribution line, about 13 miles long, connecting Cuba, York and Livingston, with the proposed transmission line; also a primary substation at or near Cuba, and three secondary substations, one each at Cuba, York and Livingston.

ENSLEY, ALA.—Bids will soon be asked for the installation of an ornamental lighting system in the downtown section. A. J. Hawkins, 1209 Martin Building, Birmingham, is engineer.

LAUREL, MISS. — The Mason Fiber Company plans to install electric power equipment in its proposed local plant for the manufacture of insulating board products, to cost about $500,000.

YAZOO CITY, MISS.—Plans are being prepared for the installation of an ornamental lighting system in the downtown section.

EL DORADO, ARK.—The installation of a new ornamental lighting system is under consideration by the City Council.

NEW IBERIA, LA.—Bids will be received by the City of New Iberia until Nov. 23 for the leasing of a franchise for a period of twenty-five years for the operation of the municipal electric light and waterworks plant and for the purchase of all the properties now used in connection with the plants.

BLACKWELL, OKLA.—The installation of a 1250-kw. turbo-generator, etc., in the municipal electric plant is under consideration by the City Council.

DACOMA, OKLA.—The city has approved a bond issue of $15,000, for the erection of a transmission line from Alva, for local light and power service. H. G. Olmsted & Company, 2230 West Eighteenth Street, Oklahoma City, are engineers.

BEAUMONT, TEX.—The Josey Ice & Coal Company, Pine Street, plans to equip its proposed ice-manufacturing plant at Long Avenue and Pearl Street, to cost about $160,000, with electrically-driven machinery.

LAMESA, TEX.—The West Texas Electric Company plans extensions in the local street-lighting system.

LA PORTE, TEX.—The plant of the La Porte Lighting & Power Company has been acquired by the Houston (Tex.) Lighting & Power Company. The latter company has started work on the erection of a high-tension line, 14 miles long, to supply electricity to La Porte and Goose Neck.

VICTORIA, TEX.—The Victoria Electric & Ice Company contemplates building an ice plant at Constitution and Bridge Streets.

Pacific and Mountain States

ANAHEIM, CAL.—The City Council contemplates the installation of ornamental lamps on East Centre Street, from South Philadelphia to South Orange Streets, using two-lamp pressed steel standards.

LOMITA, CAL.—The Board of County Supervisors is considering a petition for the establishment of an improved lighting district in this section.

LOS ANGELES, CAL.—Bonds to the amount of $92,000 have been voted by the Whitley Heights District for the installation of an underground conduit system to replace all overhead lines.

MODESTO, CAL.—The City Council has approved plans for the installation of ornamental lamps on a number of streets, consisting of 239 standards, to cost about $80,000.

NATIONAL CITY, CAL.—The Board of City Trustees has approved the installation of ornamental lamps on National Avenue.

OAKDALE, CAL.—The Pacific Gas & Electric Company, San Francisco, is planning to build a hydro-electric plant on the Stanislaus River, in connection with the Melones Dam development for the South San Joaquin and Oakdale Irrigation Districts, to cost about $2,300,000, including a steel tower transmission line.

OAKLAND, CAL.—Plans are under consideration by the E. Z. Way Soap Manufacturing Company for rebuilding its factory and power plant. The cost is estimated at about $100,000.

SAN FRANCISCO, CAL.—The Feather River Power Company, Hobart Building, has secured a preliminary permit for a hydro-electric power development on Buck's Creek, a tributary of the Feather River, to cost about $5,000,000, with steel tower transmission system.

SAN MARTIN, CAL.—The Pacific Gas & Electric Company, San Francisco, has acquired property on Church Street for a substation.

ANACONDA, MONT.—The City Council is considering establishing lighting district No. 7 in the downtown section, to include 103 lamp standards. Lena Hansen is city clerk.

DENVER, COLO.—The Gates Rubber Company, South Broadway, plans to install electric power equipment at its proposed plant additions, to cost about $250,000.

PORTALES, N. M.—The New Mexico Utilities Company, Clovis, which has acquired the municipal electric plant, plans to erect a transmission line from Clovis to Portales, about 18 miles. A transmission line will also be built to Farwell, N. M., about 12 miles long.

Canada

BRIDGEBURG, ONT.—The Provincial Hydro-Electric Commmission has authorized the construction of a transmission line west of the Welland River, about 3½ miles.

FRANKFORD, ONT.—Work has started on the construction of a new power house for the Quinte & Trent Power Company, a subsidiary of the Canada Paperboard Company, in Frankford. The company is also building a power plant at Campbellford. The cost of both plants is estimated at about $400,000.

Electrical Patents

Announced by U. S. Patent Office

(Issued September 15, 1925)

1,553,595. ELECTRIC SWITCH; H. E. Campbell, Milwaukee, Wis. App. filed Jan. 18, 1924. Drum type.

1,553,596. CONTACT DEVICE; H. W. Cheney, Milwaukee, Wis. App. filed Sept. 27, 1920. As used in controllers.

1,553,607. LIMIT STOP FOR CRANES OR HOISTS; C. J. Garrigan, Millvale, Pa. App. filed Jan. 12, 1923.

1,553,618, 1,553,619. ELECTRIC FURNACE; L. D. Kay, Los Angeles, Cal. App. filed May 22, 1923. With tilting arrangement.

1,553,625. DUPLEX RADIO SYSTEM; J. Mills, Wyoming, N. J. App. filed Dec. 24, 1920.

1,553,626. MOTOR CONTROL SYSTEM; W. N. Motter, Milwaukee, Wis. App. filed May 17, 1920.

1,553,657. SWITCHING DEVICE FOR ELECTRIC CIRCUITS; P. Zars, Dusseldorf-Grafenberg, Germany, and S. Dyhr, Berlin-Charlottenburg, Germany. App. filed Sept. 17, 1921. To open or close an electric circuit intermittently in quick succession.

1,553,663. MERCURY ELECTRIC LAMP; R. L. M. Belleaud and J. Barrollier, Courbevoie, France. App. filed Dec. 16, 1920.

1,553,696. SWITCH-BOX SUPPORT; F. S. Kay, Morland, Kan. App. filed July 3, 1922.

1,553,700. TELEPHONE-EXCHANGE SYSTEM; G. A. Lundell, New York, N. Y. App. filed April 20, 1921. Automatic.

1,553,720. RADIO SIGNALING AND CONTROL; C. P. Ryan, East Molesey, England. App. filed Feb. 27, 1924.

1,553,722. ELECTRIC HEATING MACHINE; E. Schröder, Berlin, Germany. App. filed Dec. 28, 1922. With clamping members.

1,553,725. CABLE CONNECTER; J. R. Shoffner, Dora, Pa. App. filed June 21, 1924.

1,553,726, 1,553,727. ELECTRIC WELDING MACHINE; N. P. Sjobring and M. Swanson, Chicago, Ill. App. filed July 21, 1920. For tubing.

1,553,728. ELECTRODE; N. P. Sjobring and M. Swanson, Milwaukee, Wis. App. filed Sept. 27, 1923. Roller type; as used in the welding of tubing.

1,553,742. STORAGE BATTERY; O. R. Blatter, Albion, Neb. App. filed Oct. 28, 1922. With means whereby the voltage of each cell may be indicated at a remote point.

1,553,747. SIGNAL STATION; J. O. Cardieux, Meriden, Conn. App. filed June 27, 1923. Hospital signal system.

1,553,765. TYPEWRITING MACHINE; O. Fischer, Berlin-Friedenau, Germany. App. filed Jan. 25, 1924.

1,553,771. DEVICE FOR ASSISTING NAVIGATION; W. Hahnemamn, Kitzeberg, near Kiel, Germany. App. filed Feb. 4, 1921. Method of cable signaling; induction-operated.

1,553,776. ELECTRIC COOKING APPARATUS FOR THE COOKING OF MEAT, ESPECIALLY HAMS; F. Hess, Melide, Switzerland. App. filed May 22, 1924.

1,553,787. ARRANGEMENT FOR SYNCHRONIZING PENDULUM CLOCKS WITH THE AID OF EXISTING TELEPHONE LINES; A. Mayer, Lavallois-Perret, France. App. filed June 9, 1923.

1,553,843. SAFETY FUSE FOR ELECTRICAL FLATIRONS; H. C. Adams, Minneapolis, Minn. App. filed Feb. 19, 1923.

1,553,868. ELECTRICALLY HEATED PAD; J. A. MacDonald, Brantford, Ontario, Canada. App. filed Jan. 10, 1925.

1,553,888. FUSE PLUG; W. O. Besaw, Reedley, Cal. App. filed Feb. 6, 1923.

1,553,901. X-RAY TABLE AND THE LIKE; McK. D. Hynes, Chicago, Ill. App. filed Jan. 31, 1923.

1,553,910. TROLLEY WHEEL; G. S. Moore, Indianapolis, Ind. App. filed May 31, 1923.

1,553,930. ELECTRIC SWITCH BLOCK; H. Catlin, Bridgeport, Conn. App. filed Nov. 18, 1920.

1,553,935. AUTOMATIC TELEPHONE SYSTEM; J. Erickson, Chicago, Ill. App. filed Nov. 17, 1920.

1,553,951. AUTOMATIC PARTY-LINE SELECTIVE SIGNALING SYSTEM; M. L. Nelson, Chicago, Ill. App. filed Nov. 10, 1920.

1,553,952. ATTACHMENT PLUG; A. H. Nero, New Britain, Conn. App. filed Feb. 10, 1922.

1,553,970. LIGHTING FIXTURE; S. J. Aaron, Brooklyn, N. Y. App. filed Jan. 25, 1921.

1,553,983. ELECTRICAL COIL; W. L. Casper, Brooklyn, N. Y. App. filed Dec. 26, 1919. Transformer and retardation coils.

1,554,002. ELECTRIC FURNACE; J. H. Gray, New York, N. Y. App. filed Nov. 13, 1920. Means for holding and adjusting the electrodes.

1,554,007. ANTISIDE TONE CIRCUITS; K. S. Johnson, Jersey City, N. J. App. filed Dec. 31, 1919. For use in telephone substations or two-way repeaters.

1,554,024. ALTERNATING-CURRENT MOTOR STARTER; W. E. Paul, Schenectady, N. Y. App. filed April 26, 1924. Compensator type.

1,554,028. ELECTRICAL INDICATING OR CONTROL APPARATUS; D. R. Price, Newtonville, Mass. App. filed Jan. 30, 1922. Variable-speed-generator-battery system.

1,554,030. ELECTRIC WELDING MACHINE; W. E. Reed, Pittsburgh, Pa. App. filed May 29, 1922.

1,554,048. ELECTRIC SWITCH; G. B. Thomas, Bridgeport, Conn. App. filed April 13, 1922. Key-operated type.

1,554,075. ELECTRIC FURNACE; E. Egenaes, Christiania, Norway, and O. Sandvold, Notodden, Norway. App. filed Aug. 2, 1923.

1,554,111. TELEPHONE SYSTEM; T. G. Martin, Chicago, Ill. App. filed Sept. 16, 1905. Automatic.

1,554,134. COMBINATION SWITCH PLUG AND HEATING ELEMENT SUPPORT; J. Schoenfeld, Alameda, Cal. App. filed July 2, 1923.

1,554,168. PLATING APPARATUS; W. W. Benner, Akron, Ohio. App. filed Dec. 30, 1924.

1,554,173, 1,554,174, 1,554,175. REGULATOR SYSTEM; J. H. Ashbaugh, Wilkinsburg, Pa. App. filed March 15, 1922. To maintain substantially constant power-circuit conditions.

1,554,181, 1,554,182. RENEWABLE FUSE; A. F. Daum, Pittsburgh, Pa. App. filed Jan. 14, 1921.

(Issued September 22, 1925)

1,554,188. HIGH-FREQUENCY MULTIPLEX SIGNALING SYSTEM; H. A. Affel, Brooklyn, N. Y. App. filed Sept. 30, 1919.

1,554,189. EQUALIZATION OF CARRIER TRANSMISSION; H. A. Affel, Brooklyn, N. Y. App. filed May 27, 1920.

1,554,190. DETECTING CIRCUITS; H. A. Affel, Brooklyn, N. Y. App. filed July 8, 1920. For use with transmission systems in which carrier currents are employed.

1,554,219. ELECTRIC ATOMIZER HEATER; F. T. Kitchen, New Brunswick, N. J. App. filed April 25, 1923.

1,554,231. HYSTERETIC GENERATION OF ELECTROMAGNETIC WAVES; A. Press, Washington, D. C. App. filed Feb. 18, 1921.

1,554,236. WATERPROOF MAGNETIC CHUCK; F. L. Simmons, Woonsocket, R. I. App. filed Jan. 27, 1920.

1,554,250. REACTANCE COIL; H. R. Woodrow, Boston, Mass. App. filed Nov. 2, 1921.

1,554,254. ELECTROMAGNETIC POWER DEVICE; E. Zbinden, Berne, Switzerland. App. filed filed Dec. 14, 1923. Electromagnetic tool.

1,554,266. DETECTING CIRCUITS; L. Espenschied, Queens, N. Y. App. filed July 1, 1920. For a signaling system.

1,554,273. ELECTRIC SEAM WELDING MACHINE; W. H. Gibb, Pleasant Ridge, Mich. App. filed May 22, 1922.

1,554,285. RAIL BOND AND METHOD OF MAKING SAME; C. L. Larson, Worcester, Mass. App. filed Sept. 2, 1921.

1,554,290. CARRIER TELEGRAPH SYSTEM; R. D. Parker and B. P. Hamilton, Brooklyn, N. Y. App. filed May 8, 1920.

1,554,304. LIGHT RADIATOR FOR MEDICAL PURPOSES; E. Steinberg, Berlin-Wilmersdorf, Germany. App. filed May 29, 1922.

1,554,318. SYSTEM FOR CONTROLLING ELECTRIC MOTORS; D. C. Wright, Euclid, Ohio. App. filed March 13, 1925. Remote control.

1,554,339. CIRCUIT MAKER AND BREAKER; B. L. Enochs, Springfield, Ohio. App. filed April 15, 1924. Automatic; for a trolley line which extends into a mine or similar place.

1,554,345. TELEPHONE SYSTEM WITH HIGH-FREQUENCY OSCILLATIONS; E. Habann, Waidmannslust, near Berlin, Germany. App. filed Aug. 22, 1921.

1,554,347. STAND AND AUTOMATIC SWITCH FOR ELECTRIC SADIRONS; K. P. Hansen and V. Christiansen, Astoria, Ore. App. filed Dec. 2, 1924.

1,554,349. SUBSTATION CIRCUIT; H. H. Ide, Lagrange, Ill. App. filed May 2, 1923. For automatic telephone system.

1,554,359. SWIVELING TROLLEY HARP; J. H. Lucas, Milwaukee, Wis. App. filed Aug. 27, 1923.

1,554,361. METHOD OF REPAIRING CRACKED OR BROKEN STRUCTURE BY WELDING; R. Mattice, Bethlehem, Pa. App. filed Oct. 3, 1924.

Financial and Corporate

Utility Stocks Firm

United Light & Power Class A Shares Mount to New High Level at 167

FUNDAMENTAL conditions were virtually unchanged during the week under review, and market transactions, partly on account of the Columbus Day holiday, became comparatively quiet. Prices for the most part moved within a relatively narrow range on the big board and in the unlisted markets for power and light stocks. Net changes for the week revealed a mixture of gains and losses.

Perhaps the most spectacular performance of the week was the advance in the shares of the United Light & Power class A stock. From a low for the year well below 100 this stock steadily has mounted, and last week its advance of another five points carried the issue to a new peak at 167. Improvement in the market for the issue apparently is stimulated by earning gains of the company itself, increases of a substantial sort in the earnings of American Light & Traction, of which United owns a large block of the common stock, and by new merger plans now in the making.

Strength in the shares of American Superpower A and B stocks, the former gaining two and the latter five points for the week, has started a wave of bullish sentiment. Improvement here is attributed simply to the quality of issues held by Superpower. Middle West Utilities has alternate periods of strength and weakness, but in the week under review it closed at a position three points below that of a week ago. Among the best performances in the Electric Bond & Share group were the gains of seven points in National Power & Light, five points in Carolina Power & Light and three points in Lehigh Power Securities.

Mohawk-Hudson Power Merger Advanced

Papers filed last week with the Secretary of State at Albany, N. Y., announced the merger of four companies with the Mohawk-Hudson Power Corporation. The companies involved are the Ontario Power Securities Corporation, the Niagara Power Securities Corporation and the Adirondack Power Securities Corporation, all of Schenectady, and the Wanita Holding Corporation of New York City. Charles S. Ruffner, president of the Mohawk-Hudson Power Corporation, who filed the papers, announced that the properties involved in the merger will remain intact and that the Mohawk-Hudson Power Corporation will act in the capacity of a holding or administrative company.

The merger brings under the direct control of the Mohawk corporation other light and power companies, including the Niagara, Lockport & Ontario Power Company, which is controlled by the Niagara Power and Ontario Power Securities corporations, and the Utica Gas & Electric Company, the Fulton County Gas & Electric Company, the Cohoes Light & Power Company, the Municipal Gas Company of Albany and the Adirondack Power & Light Corporation, which are controlled by the Adirondack Power Securities and the Wanita corporations.

Bonds Called in October

The following is a list of bonds of electric light and power companies called for payment in October in advance of the dates at which the securities would have matured:

			Amount	Date
Port Huron Gas & Electric	6's,	1929	$993,000	Oct. 1
Olean Elec. Lt. & Pwr.	5's,	1943	566,300	Oct. 1
Otter Tail Power, B.	7's,	1927	300,000	Oct. 1
Central States Elec	7's,	1929*	2,500,000	Oct. 1
Central Mass. Electric	7's,	1930*	35,000	Oct. 1
South Ill. Ry. & Pwr.	5's,	1942*	21,000	Oct. 1

* Not entire issues.

North American Edison's Financing

Holding Utility of North American Company's Group Makes Public Sale of Preferred Stock—Dividend Record of Subsidiaries

BY PAUL WILLARD GARRETT

ONE of the largest offerings of preferred stock made to the public this year by a holding company was the recent sale of 200,000 shares of North American Edison Company's cumulative preferred stock, entitled to dividends at the rate of $6 a year. At $97 a share, the offering price, the new stock yields 6.18 per cent, and if the plans of the company are carried out, the issue soon will be listed on the New York Stock Exchange. This holding company had bonds outstanding in the hands of the public, but until the sale of this issue had not marketed any preferred stock.

North American Edison Company, organized in March, 1922, is the holding company through which the North American Company controls some of its most important utilities. Gross earnings of the utilities under the control of the North American Edison Company aggregated $68,310,365 for the twelve months ended June 30, 1925, for example, and certain additions to the possessions have been made that are not considered in this compilation.

Not only has the business of these subsidiaries been substantial, but it has been profitable, as has been reflected in the ability of the companies to pay dividends without interruption over a long period of years. Dividends have been paid continuously for twenty-four years, for example, on the common stock of the Cleveland Electric Illuminating Company and at average annual rates in excess of 8 per cent; continuously for eighteen years at annual rates averaging over 7½ per cent on the common shares of the Union Electric Light & Power Company; continuously for twenty-two years at an annual rate over 8 per cent on the common stock of Milwaukee Electric Railway & Light Company, and for substantial periods as well upon the common shares both of the Wisconsin Gas & Electric Company and the Wisconsin Electric Power Company.

Earnings of the North American Edison Company available from its holdings of stock in these various utilities are sufficient to give a comfortable margin of safety for North American Edison securities. On completion of the present financing there will be of the latter $13,160,000 of 6 per cent secured sinking-fund bonds of 1952, $7,760,000 of 6½ per cent sinking-fund bonds of 1948, 200,000 shares of cumulative preferred stock (new issue) and 385,000 shares of common stock, the issue through which North American Company exercises control of North American Edison Company.

What will be available for charges on the new preferred stock? After deducting $41,386,123 for operating expenses for the twelve months ended June 30, 1925, from gross earnings of $68,310,365, North American Edison showed new income from operation of $26,924,242. Interest charges, preferred dividends of subsidiaries and minority interests took $12,638,003, leaving the balance before depreciation at $14,286,239. Depreciation reserve took $6,766,389, leaving a balance of $7,519,850. That balance, it may be seen, is more than six times the dividend requirements of $1,200,000 a year on the new 200,000 shares of preferred stock to be outstanding.

New Capital Issues

During the past week the North American Edison Company made an offering of 200,000 shares of preferred stock at $97 per share and accrued dividend to yield about 6.18 per cent. The proceeds of this issue are to be used for advances to and investments in the securities of the company's subsidiaries, for the retirement of floating debt heretofore incurred for similar purposes, for investments in other public utility properties or for other corporate purposes.

Also represented in the week's ac-

tivities was the National Electric Power Company, which issued 65,000 shares of class A participating stock, the price being $26.50 per share. The board of directors has declared a dividend on the class A stock payable to stockholders of record on October 15, 1925, at the rate of $1.80 per share per annum for the quarter ending October 31, 1925, and has given stockholders the option to take such quarterly dividend in class A stock in lieu of cash at the rate of one-fiftieth of a share for each share held.

Barometer for Financing

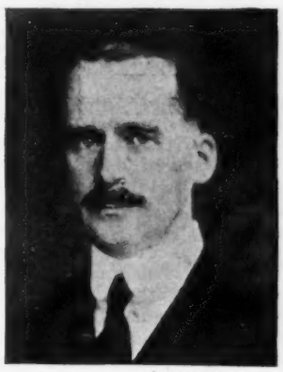
Weathervanes for Guiding Policy Behind Security Issues—Securities Should Be Sold Locally

An Interview with Colonel L. P. Ayres Vice-President Cleveland Trust Company

UTILITY executives responsible for the financial policies of their companies are interested in "barometers" that may serve in shaping their financial course from time to time. Many of these executives have established certain barometers of their own, but all are interested in the "weathervanes" used by financial houses themselves, and all are interested also in the outside viewpoints of men whose chief interests are financial rather than company operation. A recognized authority on the trend of money markets, Colonel L. P. Ayres, vice-president of the Cleveland Trust Company, who was financial adviser to President Wilson at the Paris conference, in an interview with a representative of the ELECTRICAL WORLD, describes a barometer used in making decisions on policies of financing. Other and allied aspects of utility financing are discussed by Colonel Ayres in a way that will interest any utility executive responsible for financial policies.

"Interest rates as they affect prices of securities are relative rather than absolute," said Colonel Ayres when asked what determined the market fluctuations in utility securities. "Where the interest rate on prime commercial paper is lower than the yield on high-grade bonds, the prices for the latter will tend to rise. When the rate on commercial paper rises above, say, 4½ per cent, the competition of this class of loan lessens the demand for bonds, and the volume of sales of the latter decreases, accompanied by a lowering of the price level."

The duration of interest rates at a given level is of more importance in determining security prices than the absolute values of the rates. Momentary and even wide fluctuations in interest rates are of less importance than a sustained tendency toward a high or low interest level. For this reason an accurate barometer of market conditions can be established only by continuous study of trends that continue in a given direction for some length of time. The variation of interest rates on commercial paper with respect to bond interest is an important guide for predicting future market conditions. The most important feature of this relative movement of interest rates is its duration. When rates on commercial paper have been low for some time and then gradually rise and finally cross the interest line for long-term securities, a decrease in the price of the latter is certain to follow. Conversely, a falling of the interest rate on commercial paper and its continuance at a level below the rate for bonds will finally force the price of the bonds upward until all available capital is absorbed and equilibrium is reached.



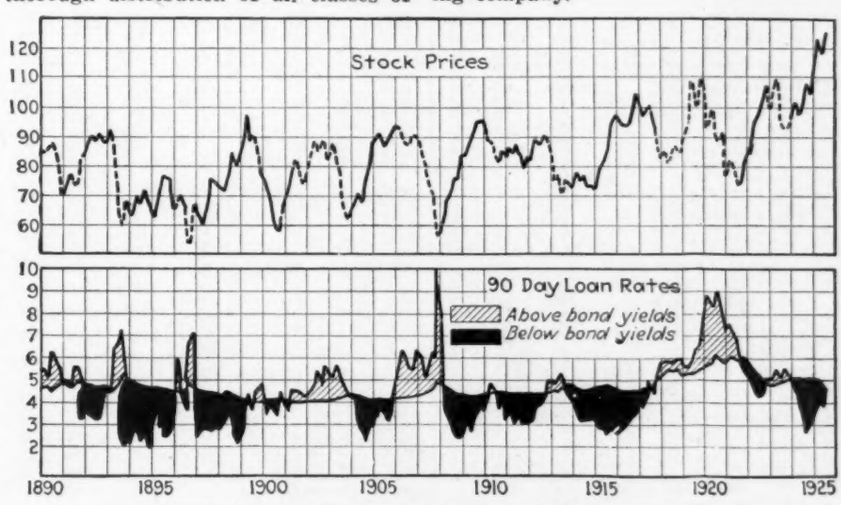
L. P. AYRES

Asked how a utility might best distribute its securities, Colonel Ayres said: "Beyond doubt, a utility should not limit itself to customer ownership, but should as far as possible market its senior securities locally. There is a sense of ownership that a community feels toward an industry whose securities are held locally. The undesirable effects of a belief by the public that a company which serves it and which enjoys a virtual monopoly is owned in Wall Street can be entirely avoided by thorough distribution of all classes of a company's securities throughout the territory which it serves."

The tremendous expansion of utility holding companies, effected largely by capitalizing equities in underlying companies, is not entirely without parallel in other financial undertakings. Colonel Ayres was asked if the experience of other financial enterprises based upon capitalized equities could serve for the guidance of utility financial policies. He replied:

"Operators of large real estate undertakings have always traded in equities. The rate of return on actual capital invested in heavily mortgaged property often reaches very high levels. The very operation of trading is often responsible for material increases in the prices of the properties. So long as the properties owned are consistent earners, the position of the syndicate is secure. It is well to remember, however, that a slight shrinkage in the gross earnings of the underlying properties will cause an exaggerated shrinkage in the earnings of the syndicate. While it is difficult to imagine a decrease in a utility's operating revenues to the vanishing point, it is not so difficult to believe that any future adjustment of an operating company's rates to a lower average level would be accompanied by a marked shrinkage in the earnings of the holder of a small equity.

"Holding companies may well give much attention to thoroughgoing studies of the rate bases of their companies in order to permit an intelligent defense of these rates against attacks that are sure to be launched at various times and in different localities. Preparedness, in the form of comprehensive information on all rate matters, will constitute a strong guarantee of sustained earnings for the utility holding company."



FLUCTUATIONS IN PRICES AND INTEREST RATES OF UTILITY STOCKS IN THIRTY-SIX YEARS

The diagram shows in the upper section the course of the average prices of industrial common stocks over the past thirty-six years. The bottom portion shows the course of two kinds of interest rates over the same period of time. The outline of the silhouette is formed by the line showing the course of the rates on the ninety-day loans in the New York market. The dividing line between the portions of the silhouette that are in solid black and those parts that are shaded is the line showing the changes over this period of the yields on sixty high-grade bonds.

The ninety-day loan rate shows the fluctuations in the kind of short-time interest that is most representative of the fluctuating costs of credit extended to brokers for carrying security holdings. The bond-yield line shows the changes in long-term interest rates.

The general rule has been that stock prices have risen during the periods when the ninety-day loan rates were lower than the yields on long-time high-grade bonds, and they have fallen when the loan rates were higher than the yields on bonds of that description.

Dividends Declared

The quarterly dividends listed below were announced during the past week by electric light and power and electrical manufacturing companies:

Name of Company	Per Cent	When Payable
American Light & Traction, com.	1¾	Nov. 2
American Light & Traction, pf.	1¾	Nov. 2
Associated Gas & Elec., class A	2½	Nov. 2
Bangor Hydro-Electric, com.	1¼	Nov. 2
California-Oregon Power, pf.	1¾	Oct. 30
Central Power & Light, pf.	$1.75	Nov. 1
Edison Electric Illum., Boston	3	Nov. 2
Electric Investors, $6 pf.	$1.50	Nov. 2
Edison Investors, $7 pf.	$1.75	Nov. 2
Hurley Machine	$1	Oct. 23
National Elec. Power, com., class A	.45	Nov. 2
Northern New Jersey Utilities, pf.	1¾	Nov. 1
Northwestern Electric, 7% pf.	1¾	Oct. 1
Northwestern Electric, 6% pf.	1½	Oct. 1
Public Service Co. of Northern Illinois, com. (no par)	$2	Nov. 2
Public Service Co. of Northern Illinois, com. (100 par)	$2	Nov. 2
Public Service Co. of Northern Illinois, 6% pf.	1½	Nov. 2
Public Service Co. of Northern Illinois, 7% pf.	1¾	Nov. 2
Wisconsin River Power, 7% pf.	$1.75	Nov. 20

Ingersoll-Rand Common Stock Reclassified. — The stockholders of the Ingersoll-Rand Company voted October 6 to change the authorized common stock from 300,000 shares, par $100, to 1,500,000 shares without par value and approved the issuance of four shares of new common stock for each share of old. The preferred stock remains unchanged. The directors were also authorized to issue 37,748 shares of common stock to be set aside for sale to the employees upon such terms as the directors determine.

Central Indiana Power Annual Report.—Reporting gross earnings for the fiscal year of $7,116,653, operating expenses and taxes of $4,632,205 and a balance of $1,131,170, officials of the Central Indiana Power Company in their annual financial statement told of a year of steady acquisition of property and expansion. The statement covers the operations of the Central Indiana and its subsidiary companies, the Indiana Electric Corporation, the Northern Indiana Power Company and the Attica Electric Company. Other subsidiaries include the Merchants' Heat & Light Company of Indianapolis and the Wabash Valley Electric Company in western Indiana. By means of charts the report depicts the rapid increase in business of the company, both as to customers served with light and power and also as to the gain in sales of electric power. The company at the close of its fiscal year served 74,714 customers as against 65,697 the year before. Total sales of power for the last fiscal year reached 172,714,372 kw.-hr., as against 123,193,611 kw.-hr. the year before.

Company Reports

The following statements of earnings were issued during the past week by electric light and power companies for the month of August:

Name of Company	Gross Earnings for August 1925	1924
Community Power & Light	$339,761	$301,699
Havana Elec. Railway, Light & Power	1,244,357	1,189,029
York Utilities	14,523	11,515

Laclede Company to Reorganize.—The Laclede Gas Light Company of St. Louis has filed with the Missouri Public Service Commission at Jefferson City a petition asking leave to lease or sell, subject to mortgages, its electric system and that of its subsidiary, the Phoenix Light, Heat & Power Company. A new corporation to be formed and owned by the stockholders of the Laclede Gas Light Company will take over the electric light properties. The lease would be subject to existing mortgages and run until 1953, at which time the property could be purchased by the new company. If the commission approves the new petition will be substituted for one filed a year ago asking for authority to segregate the electric property by an outright sale. This plan was later found inpracticable and the leasing idea was substituted.

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Saturday, Oct. 10	Low 1925	High 1925
STOCKS			
Abitibi Pwr. & Paper, com.—no par	f 69¼	62	75
Adirondack Pwr. & Lt.—7% pf.	101½	98	106
Adirondack Pwr. & Lt.—8% pf.	105	103	115
Adirondack Pwr. & Lt., com.—50.	75	31	98
Ala. Pwr., pf.	102½	97½	103
Allis-Chalmers Mfg. pf.	107½	103½	108½
Allis-Chalmers Mfg., com.	f 88½	71½	91
Amer. & Foreign Pwr., pf. 25% pd.	j133	114½	142
Amer. & Foreign Pwr., 7% pf.	f 92	87	94
Amer. & Foreign Pwr., com.	f 45½	27½	51½
Amer. Bosch Magneto, com.—no par	f 38½	26½	54½
Amer. Brown, Boveri, ptc., stk.	f 51	50½	52
Amer. Elec. Pwr., pf.	c 102½	96	104½
Amer. Gas & Elec., 6% pf.—no par	91	85	91
Amer. Gas & Elec., com.—no par	80	70	85
Amer. Lt. & Trac., 6% pf.	101	93	101½
Amer. Lt. & Trac., com.	235	139	236
Amer. Pwr. & Lt., 6% pf.	92½	84	91½
Amer. Pwr. & Lt., com.—no par	58	52	67
Amer. Pub. Serv., 7% pf.	90	88	94
Amer. Pub. Serv., com.	47	45	90
Amer. Pub. Utilities, 4% pf.	78	....	....
Amer. Pub. Utilities, 6% pf.	78	71	82
Amer. Pub. Utilities, 7% pf.	87	87	95
Amer. Pub. Utilities, com.	81	70	103½
Amer. Superpwr., pf.—25	f 27½	24½	27½
Amer. Superpwr., Class A—no par.	f41½	26½	39½
Amer. Superpwr., Class B—no par.	f45	27½	41
Amer. Wtr. Wks. & Elec., 7% pf.	100½	97½	103
Amer. Wtr. Wks. & Elec., com.	f53½	34½	68½
Appalachian Pwr., 7% pf.	98	92	100
Appalachian Pwr., 1st pf., 7%	100	95	101
Appalachian Pwr., com.—no par	78	70	83
Arizona Pwr., 7% pf.	80	75	87
Arizona Pwr., com.	25	15	33
Arkansas Cent. Pwr., pf., $7—no par	100	97	102
Arkansas Lt. & Pwr., 7% pf.	98½	92	102
Arkansas Lt. & Pwr., com.	100	65	101
Asheville Pwr. & Lt., 7% pf.	f101	98	102½
Assoc. Gas & Elec., 7% pf.—1% extra—50.	f 50	....	....
Assoc. Gas & Elec., pf.—$6—no par	f 85	....	....
Assoc. Gas & Elec., Class A	f 38½	....	....
Babcock & Wilcox, com.	147	....	....
Birmingham Elec. pf.—$7—no par.	98	98	101½
Blackstone Valley Gas & Elec., com.—50	89	....	....
Brazilian Trac., Lt. & Pwr., com.	f 81½	....	....
Broad River Pwr., pf.	94	90	97
Brooklyn Edison, com.	f145	120½	147
Buffalo Gen. Elec., com.	63	44	73½
Buffalo, Niagara & East. Pwr., pf.—25	f 23½	....	....
Buffalo, Niagara & Eastern Pwr., com.	f 25½	....	....
Carolina Pwr. & Lt., pf.—$7—no par	103	100	107
Carolina Pwr. & Lt., com.	410	290	440
Central Ariz. Lt. & Pwr., pf.	100	100	106
Central Ark. Ry. & Lt., 7% pf.	96	91	98½
Central Ill. Pub. Serv., 6% pf.	86	84	93
Central Ind. Pwr., 7% pf.	89	88	95
Central Pwr. & Lt., pf.	94½	88	95
Central States Elec., 7% pf.	95	87	98
Central States Elec., com.	190	70	200
Chicago Fuse Mfg., com., no par	a35	27½	39½
Cincinnati Gas & Elec., com.	87½	82	90
Cities Service, 6% pf.	83½	80	84
Cities Service, pf. B—10.	f 7½	7½	8
Cities Service, pf. BB—100.	f79½	....	....
Cities Service, com.	38	34	43
Cities Service, Bkr. Shrs.	17½	16½	22
Cleveland Elec. Illg., 6% pf.	102	101	105
Cleveland Elec. Illg., com.	240	200	250
Colorado Pwr., 7% pf.	95	93	98
Columbia Gas & Elec., 7% pf.	f112½	104½	113
Columbia Gas & Elec., com.—no par	f 78½	45½	78½
Columbia Ry., Gas & Elec., 6% pf.	90	90	90
Columbus Elec. & Pwr., 2d pf.	f100	....	....
Columbus Elec. & Pwr., com.	f134	....	....
Columbus Ry., Pwr. & Lt., pf. A	97	86	99
Columbus Ry., Pwr. & Lt., pf. B	90	80	85
Columbus Ry., Pwr., & Lt., com.	150	114	150
Commonwealth Edison, com.	a130½	130½	141½
Commonwealth Pwr., 6% pf.	82½	80	85½
Commonwealth Pwr., com—no par.	32	30½	43½
Conn. Lt. & Pwr., 8% pf.	115	115	118
Conn. Lt. & Pwr., 7% pf.	106	105	110
Cons. Gas of N. Y., pf.	f 58	....	....
Cons. Gas of N. Y., com—no par.	f 93½	74½	94½
Cons. Gas Elec. Lt. & Pwr. of Balti., 6% pf.	j104½	102	104½
Cons. Gas, Elec. Lt. & Pwr. of Balti. 6½% pf.	c 110	105	110½
Cons. Gas, Elec. Lt. & Pwr. of Balti. 7% pf.	c 113	109	114
Cons. Gas, Elec. Lt. & Pwr. of Balti	c 125½	122	127½
Cons. Gas, Elec. Lt. & Pwr. of Balti. com.—no par.	c 45	32	47½
Cons. Utilities of Dela., 7% pf.	j 85	80	84
Consumers Pwr., 6% pf.	95	90	97
Consumers Pwr., 6 6% pf.	101	97	102
Continental Gas & Elec., 7% ptc. pf	94½	85	97
Continental Gas & Elec., 7% pr. pf.	94	89	95
Continental Gas & Elec., com.	150	77	145
Crocker Wheeler, com.	15	21	28
Crocker Wheeler, pf.	..	65	80
Dallas Pwr. & Lt., 7% pf.	102	100	102½
Dayton Pwr. & Lt., 6% pf.	95	88	100
Dayton Pwr. & Lt., com.	420	180	460
Detroit Edison, com.	f153½	110	159½
Dubilier Condenser & Radio, com.	f 16	....	....
Dubuque Elec., 7% pf.	90	80	90
Duquesne Lt., 7% pf.	111	104	112
East. Tex. Elec., 7% pf.	100	100	105
East. Tex. Elec., com.	80	70	75½
Edison Elec. Illum. of Boston, com.	d210	200	213
El Paso Elec., com.	f 72	....	....
El Paso Elec., pf.	f100	....	....
Elec. Bond & Share, 6% pf.	f104	101½	106½
Elec. Bond & Share Sec., com.—no par	f 65	56½	80½
Elec. Investors, 6% pf.	94	95	96
Elec. Investors, com.	60	30	66
Elec. Investors, 10% pd. receipts	42	15	48
Elec. Pwr. & Lt., ctfs, pf.	f 91½	89½	94
Elec. Pwr. & Lt., ctfs., 40% pd.	f106½	100	110
Elec. Pwr. & Lt., ctfs., com.	f 32	17½	40½
Elec. Storage Battery, com.—no par	f 71½	60½	71½
Elmira Wtr., Lt. & R.R., 7% pf.	94	93	98
Empire Dist. Elec., 6% pf.	80	78	85
Engr. Pub. Serv., pf.	99½	100	103
Engr. Pub. Serv., com.—no par.	20½	22½	30
Eureka Vacuum Cleaner, com.—no par.	53½	42	52½
Fairbanks Morse, com.	f 49	32½	51
Federal Lt. & Trac., com.	f 26	26	36
Federal Light & Traction, pf.	f 82½	52½	86½
Federal Utilities, pf.	f 75	....	....
Federal Utilities, com.	f 17	....	....
Ft. Worth Pwr. & Lt., 7% pf.	f106	99½	107½
Galveston-Houston Elec., 6% pf.	64	70	75
Galveston-Houston Elec., com.—no par.	17	32	40
Gen. Elec., com.	f302	227½	337½
Gen. Elec., special—10.	f 11½	11	11½
Gen. Gas & Elec., 6% pf.	205	72	240
Gen. Gas & Elec., 7% pf.	165	120	175
Gen. Gas & Elec., com.	200	72	240
Gen. Gas & Elec., (Me.) pf.—$7—no par	130	90	175
Gen. Gas & Elec., (Me.) pf.—$8—no par.	140	104½	180
Gen. Gas & Elec. (Del.) com. A no par.	a 56½	42	64½
Gen. Gas & Elec. (Del.) com. B no par.	52	40	62
Gen. Gas & Elec. (Del.) A pf. 7% no par.	95	97½	100
Gen. Gas & Elec. (Del.) A pf. 8% no par.	105	90	110
Gen. Gas & Elec. (Del.) B pf. 7% no par.	94	88	96
Ga. Lt., Pwr., & Rys., 6% pf.	78	74	85
Ga. Lt., Pwr. & Rys., com.	60	25	74
Ga. Ry. & Elec. .5% pf.	j 83	78½	84½
Ga. Ry. & Elec. com.	j124½	115½	115½
Ga. Ry. & Pwr., 8% pf.	f112	....	....
Ga. Ry. & Pwr., 7% pf.	f102	....	....
Ga. Ry. & Pwr., 4% pf.	105	62	110
Ga. Ry. & Pwr., com.	105	62	118
Gt. Western Pwr., 7% pf.	h 101½	98½	104
Havana Elec. Ry., Lt. & Pwr., com.	f 240	112	246
Havana Elec. Ry., Lt. & Pwr., pf.	j116	115	116
Hurley Machine, com.—no par.	a 49½	41½	56
Idaho Pwr., 7% pf.	100½	97½	102
Ill. No. Utilities, 6% pf.	88	82	92
Ill. Pwr. & Lt., 7% pf.	97	92½	98
Int. Combustion Engr., com.—no par.	f 46	31½	51
Int. Utilities, class A—no par.	f 33½	31	46½
Int. Utilities, class B—no par.	f 8½	6½	17
Interstate Pwr., pf., $7, no par.	90	90	95
Interstate Pub. Serv., 7% pf.	96	90	100
Iowa Ry. & Lt., 7% pf.	97	92	100
Jersey Central Pwr. & Lt., 7% pf.	95	90	96

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco. iBid price, low, high, Oct. 13. jLatest quotations available.

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Saturday, Oct. 10	Low 1925	High 1925
STOCKS—Continued			
Jersey Central Pwr. & Lt., com.	45	15	50
Johns-Manville, com.—no par	f167½	....	....
Kansas Gas & Elec., 7% pf.	f 99	97½	102
Kelvinator Corp., com.—no par	f 58½	....	....
Kentucky Hydro-Elec., com.	a 91	85½	92½
Kentucky Sec., 6% pf.	73	67	78
Kentucky Sec., com.	80	77	87
Kentucky Utilities, 6% pf.	91	82	95
Kings County Ltg., 7% pf.	f100	....	....
Laclede Gas Lt., com.	f 170	110½	178
Lehigh Pwr. Sec., com.—no par	145	82	155
Long Island Ltg., 7% pf.	104½	100	105
Long Island Ltg., com.	120	60	105
Los Angeles Gas & Elec., 6% pf.	95	90	97
Manila Elec., com.—no par	39½	28½	49½
Maytag Mfg., com.	f 23½	....	....
Memphis Pwr. & Lt., pf., $7, no par	101½	98½	102
Metropolitan Edison, pf.—$6 no par	95	95	96
Metropolitan Edison, pf., $7, no par	104	100	110
Middle West Utilities, 7% pf.	a96½	91½	98½
Middle West Utilities, 7% pr. lien pf.	a105	98	107½
Middle West Utilities, com.—no par	a111½	82½	125
Midland Utilities, pr. ln. pf.	a 99½	98½	101
Milwaukee Elec. Ry. & Lt., 8% pf.	100	98	105
Milwaukee Elec. Ry. & Lt., 7% pf.	98	96	105
Milwaukee Elec. Ry. & Lt., 6% pf.	87	83½	87
Minn. Pwr. & Lt., 7% pf.	f 99½	97½	102
Miss. Pwr. & Lt., pf.	f100	....	....
Miss. River Pwr., 6% pf.	92	87½	94
Miss. River Pwr., com.	105	37	106
Montana Pwr., com.	f 83½	64	99½
Montreal Pwr., com.	f218½	....	....
Mountain States Pwr., pf.	f 93	....	....
Mountain States Pwr., com.	f 26	....	....
National Carbon, pf.	a122	120	130
National Elec. Pwr., pf.	94½	94	96½
National Lt., Ht. & Pwr., 5% pf.	67	40	65
National Lt., Ht. & Pwr., com.—no par	11	11	....
National Pwr. & Lt., pf., $7—no par	100½	95	99
National Pwr. & Lt., com.—no par	395	185	403
National Pub. Serv., 7% pf.	f 95	....	....
National Pub. Serv., pfc. pf.	f 98	....	....
National Pub. Serv., A com.—no par	25½	22½	30
National Pub. Serv., B com.—no par	17	14	20
Nebraska Pwr., 7% pf.	f101½	98½	103½
Nevada-Calif. Elec., com.	f38½	31	50½
N. J. Pwr. & Lt., 7% pf.	104	92	102
New Orleans Pub. Serv., 7% pf.	97	94	102
New Orleans Pub. Serv., com.—no par	f 30	31	38½
N. Y. Central Elec., 7% pf.	97	96	101
Niagara Falls Pwr., 7% pf.—25	27½	27½	29
Niagara, Lock. & Ont. Pwr., 7% pf.	f106	101½	110
Niagara, Lock. & Ont. Pwr., com.—no par	f 65	60	73
Nizer Corp., A.—no par	f 63½	37	70
Nizer Corp., B.—no par	f 63½	....	....
No. Amer., 6% pf.—50	f 49½	46½	50½
No. Amer., com.—50	f 67	41½	67½
No. Caro. Pub. Serv., pf.—$7—no par.	90	90	96
No. N. Y. Utilities, 7% pf.	f101½	....	....
No. Ohio Pwr., com.	11½	5	13½
No. Ohio Trac. & Lt., 6% pf.	73	64	75
No. Ont. Lt. & Pwr., pf.	78	68	78
No. Ont. Lt. & Pwr., com.	49	41	52
No. States Pwr., 7% pf.	99	95	100
No. States Pwr. com.	123	103	125
No. Texas Elec., 6% pf.	50	60	75
No. Texas Elec., com.	40	40	70
Ohio Gas & Elec., 7% pf.	90	87	100
Ohio Pwr., 6% pf.	91	85	95
Ohio Pub. Serv., 7% pf.	97½	97	100
Ohio River Edison, 7% pf.	97	93½	100½
Oklahoma Gas & Elec., pf.	f93	....	....
Pacific Gas & Elec., 6% pf.	97	92	99
Pacific Gas & Elec., com.	f121	102½	128½
Pacific Pwr. & Lt., 7% pf.	f 99	97½	101
Parr Shoals Pwr., 6% pf.	92	90	100
Penn Central Lt. & Pwr., pf.—no par	c71	60	71
Penn-Ohio Elec., 7% pf.	93	83½	96
Penn-Ohio Pwr. & Lt., 7% pf.	93	91	100
Penn-Ohio Pwr. & Lt., 8% pf.	103	101	110
Penn Pwr. & Lt.—$7—no par.	f103½	98½	106
Penn Pub. Serv., 7% pf.	96	90	100
Penn Pub. Serv., 6% pf.	85	80	90
Penn Wtr. & Pwr., com.	1 8	120	178
Phila. Co., pf.—50	f 48½	45½	49
Phila. Co., com.	f 57½	51½	62½
Phila. Elec., com.	c 46½	37½	49½
Pittsburgh Utilities, pf.	f 14½	12½	17½
Portland Elec. Pwr., 7% pf.	97	95	99
Portland Elec. Pwr., 6% pf.	68	70	80
Portland Elec. Pwr., com.	39	40	53
Portland Ry., Lt. & Pwr., pf.	f 72	....	....
Portland Ry., Lt. & Pwr., com.	f 41	....	....
Pwr. Corp. of N. Y., 7% pf.	f110	96	112
Pwr. Corp. of N. Y., com.—no par	77	15	89½
Pwr. Sec., pf.	25	30	55
Pwr. Sec., com.	13	8	30
Pub. Serv. of N. J., 7% pf.	104½	99	105½
Pub. Serv. of N. J., 8% pf.	116	108½	117½
Pub. Serv. of N. J., com.—no par.	f 79½	62½	87½
Pub. Serv. of No. Ill., 6% pf.	96	90	97
Public Serv. of No. Ill., 7% pf.	a110	102	110½
Pub. Serv. of No. Ill., com.—no par	a128	107½	128½
Pub. Serv. of No. Ill., com.	f126½	118	128½
Pub. Serv. of Okla., 7% pf.	94	87	95
Pub. Serv. Elec. & Gas, 6% pf.	f 97	92½	97½
Puget Sound Pwr. & Lt., 7% pf.	106	102½	107
Puget Sound Pwr. & Lt., 6% pf.	f 84	....	....
Puget Sound Pwr. & Lt., com.	48	49	61
Radio Corp. of Amer., pf.—50	f 48½	48	54
Radio Corp. of Amer., com.—no par	f 57½	48½	77½
Republic Ry & Lt., pf.	81½	70	85
Republic Ry. & Lt., com.	61	49	65
Rochester Gas & Elec., 5% pf.	105	80	98
Servel Corp., Class A.	f 30½	....	....
Sierra Pacific Elec., com.	f 5	....	....
Sioux City Gas & Elec., 7% pf.	f 99	....	....
Southeastern Pwr. & Lt., 7% pf.	97	90	100
Southeastern Pwr. & Lt., new com.	29	28	33
So. Calif. Edison, 8% pf.	130	115	128
So. Calif. Edison, 7% pf.	111	105	107½
So. Calif. Edison, 6% pf.	97	90	95½
So. Calif. Edison, com.	136	102	139
Southern Cities Utilities, 7% pf.	82	77	100
Southern Cities Utilities, com.	57	30	71
Southern Pwr. & Lt. of Md., pf.	f107	....	....
Southern Pwr. & Lt. of Md., com.	f 32	....	....
Southwestern Pwr. & Lt., A.	f 47	....	....
Southwestern Pwr. & Lt., B.	f 22½	....	....
Southwestern Pwr. & Lt., 7% pf.	98½	90	102
Springfield (Mo.) Ry. & Lt., 7% pf.	94	92	93
Standard Gas & Elec., 8% pf.	f 53½	50½	55½
Standard Gas & Elec., 7% pf.	99½	96	100
Standard Gas & Elec., com.—no par	f 58½	40½	59½
Standard Pwr. & Lt., 7% pf.	103	95	114½
Superheater, com.—No par.	140	120	152
Tampa Elec., com.	f250	....	....
Tenn. Elec. Pwr., 6% pf.	85	80	85
Tenn. Elec. Pwr., 7% pf.	99	93	103
Tenn. Elec. Pwr., pf.—$6—no par.	f80	72	84
Tenn. Elec. Pwr., com.—no par.	f65	....	....
Tex. Pwr. & Lt., 7% pf.	f101½	99½	103½
Tide Water Pwr., 8% pf.	f 98	....	....
Timken Roller Bearing, com.	f 56½	37½	56½
Toledo Edison, 8% pf.	112	109	114
Toledo Edison, 7% pf.	100	94	101½
Toledo Edison, com.	25	21	25
Tri-City Ry. & Lt., 6% pf.	85	82	85
United Gas & Elec., 6% pf.	90	80	94
United Gas & Elec., com.—no par.	45	26	49
United Gas & Elec. (N. J.), 5% pf.	62	55	65
United Gas Impr.—50	c 98	79½	100½
United Lt. & Pwr., pf.—$4—no par	50	41	51
United Lt. & Pwr., pf.—$6.50—no par.	92	83	99
United Lt. & Pwr., com., A—no par.	161	42	162½
United Lt. & Pwr., com., B—no par.	170	40	165½
Utah Pwr. & Lt., 7% pf.	f 98½	97½	101½
Utica Gas & Elec., 7% pf.	102	100	104
Utica Gas & Elec., com.	200	100	200
Utilities Pwr. & Lt., 7% pf.	90	90	97
Utilities Pwr. & Lt., com. B—no par	17	12	20
Vermont Hydro-Elec., 7% pf.	93	87	96
Virginia Pwr., 7% pf.	101	94	107
Virginia Pwr., com.	65	65	92
Virginia Ry. & Pwr., com.	f125	64½	135½
Wagner Elec., pf.	b 89	79	91
Wagner Elec., com.—no par	b 41	26½	50
Washington Wtr. Pwr., com.	129	110	140
West Mo. Pwr., 7% pf.	f 91	....	....
West Penn., 7% pf.	f 97	94	100
West Penn, com.	f 110½	97	145
West Virginia Lt., Ht. & Pwr., 7% pf.	94	94½	96½
West Va. Utilities, 7% pf.—50	41	38	47
Western Elec., 7% pf.	f 83	110	117½
Western Pwr., 7% pf.	97	84	95½
Western Pwr., com.—no par	80	34	83
Western States Gas & Elec., 7% pf.	89	82	92
Western States Gas & Elec., com.	f 20	....	....
Westinghouse Elec. & Mfg., com.—50	f 74½	66½	84
Weston Elec. Instrument, cl. A	f 28½	19½	28½
Weston Elec. Instrument, com.	f 17½	9½	20½
Wis.-Minn. Lt. & Pwr., 7% pf.	f90	92	95
Wis. Pwr., Lt. & Ht., 7% pf.	85	85	90
Worthington Pump, pf. A	79	77	88
Worthington Pump, pf. B	64	58	76½
Worthington Pump, com.	f 44½	35½	79½
Yadkin River Pwr., 7% pf.	f103	98	105
Yale & Towne, com.—25	69½	62	70½
BONDS			
Abitibi Pwr. & Paper	6s 1940	100½	98	101½
Adir. Elec. Pwr.	5s 1962	99½	97½	100½
Adir. Pwr. & Lt.	6s 1950	104½	102½	105½
Adir. Pwr. & Lt.	5s 1930	95	94	97½
Ala. Pwr.	5s 1946	98	96	100
Ala. Pwr.	5s 1951	97½	92½	97½
Ala. Pwr.	6s 1951	104½	101½	105
Ala. Trac. Lt. & Pwr.	5s 1962	100	86	102
Aluminum Co. of Amer.	7s 1933	106½	106½	107½
Amer. Bosch Magneto	8s 1936	103	86	101
Amer. Gas & Elec.	5s 2007	91	90	93½
Amer. Gas & Elec.	6s 2014	97	96½	98½
Amer. Pwr. & Lt.	6s 2016	95½	94	98
Amer. Pub. Serv.	6s 1942	98	94	99½
Amer. Wtr. Wks. & Elec.	5s 1934	95½	92½	98
Anaconda Copper	6s 1929	103	102½	104
Anaconda Copper	6s 1953	100½	99½	102
Anaconda Copper	7s 1938	102½	99½	104
Appalachian Pwr.	5s 1941	97½	96	99½
Appalachian Pwr.	6s 2024	92½	86½	94½
Appalachian Pwr.	7s 1936	105	105½	106½
Arizona Pwr.	6s 1933	100	97½	101½
Arizona Pwr.	6s 1947	95	90	96
Ark. Central Pwr.	6s 1948	100½	98½	102½
Ark. Lt. & Pwr.	6s 1945	102½	100	104½
Ark. Lt. & Pwr.	6s 1954	98	92½	99½
Assoc. Gas & Elec.	6s 1965	93½	92	96
Assoc. Gas & Elec.	6½s 1954	101	94½	106
Binghamton Lt., Ht. & Pwr.	5s 1946	98	94½	98½
Birmingham Elec.	6s 1954	100½	99	103
Birmingham Ry., Lt. & Pwr.	4½s 1954	87½	85	89½
Broad River Pwr.	6½s 1934	101½	99	102
Brooklyn Edison	5s 1949	104½	99½	103
Brooklyn Edison	6s 1930	104½	103½	106
Buffalo Gen. Elec. 1st	5s 1939	101½	100½	101½
Buffalo Gen. Elec. 1st & Ref.	5s 1939	100½	100	100½
Burlington Ry. & Lt.	5s 1932	94½	90	96
Butte Elec. & Pwr.	5s 1951	99½	99	100½
Calif. Gas & Elec.	5s 1937	100	98	101½
Canadian Lt. & Pwr.	5s 1949	40	36	62
Canton Elec.	5s 1937	99	99	100½
Carolina Pwr. & Lt.	5s 1938	99½	98½	100½
Carolina Pwr. & Lt.	6s 1953	104½	103½	105
Cedar Rapids Mfg. & Pwr.	5s 1953	99½	98½	100½
Central Ark. Ry. & Lt.	5s 1928	98½	98½	100
Central Ga. Pwr.	5s 1938	95½	93	97
Central Ill. Lt.	5s 1943	98	94	99½
Central Ill. Publ Serv.	5s 1952	90	84½	92½
Central Ill. Pub. Serv.	6s 1944	99½	96½	101½
Central Ind. Pwr.	6s 1947	97½	95½	99½
Central Fla. Pwr. & Lt.	6s 1944	99	97	100½
Central N. Y. Gas & El.	5s 1941	95	94	97½
Central Pwr. & Lt.	6s 1946	101	97½	101
Central Pwr. & Lt.	6½s 1952	101½	94	102
Central States Elec.	5s 1926	99	98	100
Chattanooga Ry. & Lt.	5s 1956	84	81	85
Cincinnati Gas & Elec.	5s 1956	10	98½	104½
Cincinnati Gas & Elec.	5½s 1967	103½	100½	105
Cities Service	6s 1966	90½	90	91½
Cities Service	7s B 1966	175	150½	178
Cities Service	7s C 1966	124½	111	128½
Cities Service	7s D 1966	102	98½	106½
Cities Service	7s E 1966	f112½	112	112
Cities Service Pwr. & Lt.	6s 1944	93½	93½	95½
City Lt. & Trac., Sedalia, Mo.	5s 1952	84	74	85
Cleveland Elec. Illum.	5s 1939	101½	100	102
Cleveland Elec. Illum.	5s 1954	100½	97½	101½
Cleveland Elec. Illum.	7s 1941	110	109	111½
Colorado Pwr.	5s 1953	95½	93	96½
Columbia Gas & Elec.	5s 1927	99½	99½	100½
Columbia Ry., Gas & El.	5s 1936	92	92½	94½
Columbus, Dela. & Marion Elec.	5s 1937	85	83	88
Columbus, Dela. & Marion Elec.	6s 1937	95	91	98
Columbus Elec. & Pwr.	6s 1947	f102	....	....
Columbus Ry., Pwr. & Lt.	5s 1940	95½	93½	98
Columbus Ry., Pwr. & Lt.	6s 1941	103	101½	105
Commonwealth Edison	5s 1943	a102	99½	102½
Commonwealth Edison	5s 1953	99½	98½	101
Commonwealth Edison	5s 1954	99½	98	101
Commonwealth Pwr.	6s 1947	102½	97½	103½
Community Pwr. & Lt.	6s 1950	96	94½	98
Conn. Ry. & Ltg.	4½s 1951	89½	90½	92½
Consol. Cities, Lt., Pwr. & Trac.	5s 1962	80½	75½	82½
Consol. Elec.	5s 1955	96	94	98½
Consol. Gas of N. Y.	5½s 1945	103½	101½	105
Con. Gas, Elec. Lt. & Pwr. of Balti.	4½s 1935	97	95½	97½
Con. Gas, Elec. Lt. & Pwr. of Balti. (notes)	6s 1949	c106½	104½	106½
Con. Gas, Elec. Lt. & Pwr. of Balti.	5s 1965	99	98	100½
Consumers Elec. Lt. & Pwr.	5s 1936	94	93	96½
Consumers Pwr.	5s 1936	99½	99	100½
Consumers Pwr.	5s 1952	96½	90½	100
Consumers Pwr.	5½s 1954	102½	99	104½
Continental Gas & Elec.	5s 1927	99½	99½	100½
Continental Gas & Elec.	6s 1947	99½	98	101
Continental Gas & Elec.	6½s 1964	98	96½	101
Continental Gas & Elec.	7s 1954	103½	90	103½
Cumberland County Pwr. & Lt.	5s 1942	94½	92	96½
Dallas Pwr. & Lt.	6s 1949	104½	103	105½
Dayton Ltg.	5s 1937	99½	98½	100½
Dayton Pwr. & Lt.	5s 1941	99	97	100½
Defiance Gas & Elec.	5s 1942	95	88½	97½
Denver Gas & Elec.	5s 1949	97½	97½	100
Denver Gas & Elec. Lt.	5s 1951	93	92	95½
Des Moines Elec.	5s 1938	98	98	100½
Detroit Edison	5s 1933	101½	99½	102½
Detroit Edison	5s 1940	102½	99½	102½
Detroit Edison	5s 1949	100	97	101½
Detroit Edison	5s 1955	99½	97½	100
Detroit Edison	6s 1932	154	110½	155
Detroit Edison	6s 1940	107½	106½	108½
Detroit Edison	7s 1928	151	125	156½
Detroit Edison	7s 1929	f156½	114	156½
Detroit Edison	7s 1930	151	121½	158½
Dominion Pwr. & Trans.	5s 1932	95½	95½	98½
Driver-Harris	8s 1931	93	88	97
Dubuque Elec.	6s 1942	101	97½	102
Duke-Price Pwr.	6s 1949	101½	98½	103
Duquesne Lt.	6s 1949	106	104½	107½
Duquesne Lt.	5½s 1949	104½	104	106
Durham Pub. Serv.	7s 1949	100	97½	101½
East Penn. Elec.	6s 1953	104	100½	105½
East Oregon Lt. & Pwr.	6s 1929	100	97½	100½
East. Tex. Elec.	5s 1942	f 94½	....	....
Economy Lt. & Pwr.	5s 1956	98	96	99½
Edison Elec. Illum. of Bkln.	4s 1939	92	89	95½
Edison Elec. Illum. (N. Y.)	5s 1995	103	99½	103
El Paso Elec.	5s 1932	f103	....	....
El Paso Elec.	5s 1950	f 95½	....	....
Elec. Pwr. Corp. (Germany)	6½s 1950	87	86½	88½
Emira Wtr., Lt. & R.R.	5s 1956	95	92½	96½
Empire Dist. Elec.	5s 1949	90	86½	91½
Erie Ltg.	5s 1967	98	95½	99½
Evansville Gas & Elec. Lt.	5s 1932	98½	96	100
Federal Lt. & Trac.	5s 1942	92	88	101½
Federal Lt. & Trac.	6s 1942	100½	96½	103
Federal Lt. & Trac.	6s 1954	92½	91½	104½
Ft. Smith Lt. & Trac.	5s 1936	78½	76½	82½
Ft. Worth Pwr & Lt.	5s 1931	99	99	100½
Galveston Elec.	5s 1940	91	86½	93½
General Elec.	3½s 1942	87½	83	88
General Elec.	5s 1952	f107½	101½	107½
Georgia Carolina Pwr.	5s 1952	85½	82	90
Ga. Lt., Pwr. & Rys.	5s 1941	87	86½	90½
Ga. Ry. & Elec.	5s 1932	98	98½	100½
Ga. Ry. & Elec.	5s 1949	91½	88	94½
Ga. Ry. & Pwr.	5s 1954	93½	89½	96
Ga. Ry. & Pwr.	6s 1947	102	100½	103½
Ga. Ry. & Pwr.	7s 1941	104½	105	107
German Gen. Elec.	7s 1945	95	92	95
Great Cons. Elec. Pwr. (Japan)	6½s 1950	86	86	86½
Great Cons. Elec. Pwr. (Japan)	7s 1944	90½	87½	91½
Great Falls Pwr.	5s 1940	102½	99½	102½
Great Northern Pwr.	5s 1935	98	96	99
Great Western Pwr.	5s 1946	98½	95	99½
Great Western Pwr.	5½s 1952	97½	96	99
Great Western Pwr.	6s 1949	100½	100	102½
Great Western Pwr.	6s 1952	101	99½	102½
Havana Elec. Ry., Lt. & Pwr.	5s 1954	93	85½	95½
Holtwood Pwr.	6s 1954	103	100	104½
Houston Ltg. & Pwr.	5s 1931	99½	98½	100
Houston Ltg. & Pwr.	5s 1953	94	90½	95½
Houston Ltg. & Pwr.	5½s 1954	100	97	101½
Hydraulic Pwr.	5s 1951	101	99½	102
Hydraulic Pwr.	5s 1950	101	100	103
Idaho Pwr.	5s 1947	95	93	97½

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco. †Bid price, low, high, Oct. 13. ‡Latest quotations available.

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies			Bid Price Saturday, Oct. 10	Low 1925	High 1925
BONDS (Continued)					
Ill. Elec. Pwr.	6s	1943	102	99½	103½
Ill. Pwr.	5s	1933	93½	93	95½
Ill. Pwr. & Lt.	6s	1953	100½	100½	100½
Ill. Pwr. & Lt.	7s	1953	101	99	102½
Ind. Elec.	6s	1947	98	97	99½
Ind. Gen. Serv.	5s	1948	95	92	97½
Ind. Lighting	4s	1958	80½	78	83
Indiana & Mich. Elec.	5s	1957	98½	97½	99½
Indiana & Mich. Elec.	5s	1955	95	95	98
Ind. Pwr.	7½	1941	ƒ105½	104	106
Ind. Service	5s	1950	89½	86½	92
Ind. Service	6s	2020	86½	73	88½
Ingersoll-Rand	5s	1935	99½	92	99½
Interstate Elec.	6s	1933	95	95	99½
Interstate Pwr.	6s	1944	97½	95	99
Interstate Pwr.	7s	1934	99½	97	100½
Interstate Pub. Serv.	6s	1948	98	96	100½
Iowa Ry. & Lt.	5s	1932	97½	97	99½
Jersey Cent. Pwr. & Lt.	5½s	1945	96	95	98
Kansas City Pwr. & Lt.	5s	1952	99½	95½	101
Kansas Elec. Pwr.	6s	1937	100	97½	102
Kansas Elec. Pwr.	6s	1943	100	97½	102
Kansas Gas & Elec.	6s	1952	101½	98½	103½
Kansas Gas & Elec.	6s	2022	91½	86½	94½
Kentucky Utilities	6s	1949	99½	97	101½
Kings County Elec. Lt. & Pwr.	5s	1937	102½	90	103
Kings County Elec. Lt. & Pwr.	6s	1997	118	114½	120½
Kings County Ltg.	5s	1954	98½	89	101½
Kings County Ltg.	6½s	1954	106½	103½	108½
Knoxville Ry. & Lt.	5s	1946	92½	88	95½
Laclede Gas Lt.	5s	1934	99½	98½	101½
Laclede Gas Lt.	5½s	1953	99½	95½	102
Laurentian Pwr.	6s	1936	99½	96	100
Laurentide Pwr.	6s	1936	‹99	96	100
Laurentide Pwr.	5s	1946	99½	97	100½
Lehigh Pwr. Sec. (notes)	6s	1927	101	100½	101½
Lincoln Gas & Elec.	5s	1941	91	92½	95½
Long Island Ltg.	5s	1936	100	98	100½
Long Island Ltg.	6s	1954	100	99½	102
Long Island Ltg.	6s	1948	103	102	105½
Long Island Ltg.	6s	1954	100½	99½	102
Los Angeles Gas & Elec.	5s	1939	98	98	101½
Los Angeles Gas & Elec.	5½	1943	97½	94	99½
Los Angeles Gas & Elec.	5½s	1947	97½	96	99½
Los Angeles Gas & Elec.	5½s	1949	97	95½	99½
Los Angeles Gas & Elec.	6s	1942	100	101½	104½
Louisiana Pwr.	5s	1944	97½	97	99
Louisville Gas & Elec.	5s	1952	96½	90½	99½
Louisville Gas & Elec.	5½s	1954	101½	99	102
Lower Austrian Hydro Elec.	6½s	1944	85½	85½	86½
Luzerne County Gas & Elec.	5s	1948	98	97	99½
Luzerne County Gas & Elec.	7s	1944	103	99½	104½
Luzerne County Gas & Elec.	6s	1954	101½	99	105
Madison River Pwr.	5s	1935	99	99½	101
Manila Elec.	7s	1942	101	97½	102½
Manila Elec. Ry. & Ltg.	5s	1953	89	85	92
Manitoba Pwr.	7s	1941	104½	98½	104½
Memphis Pwr. & Lt.	5s	1948	94½	95	99½
Metropolitan Edison	6s	1952	104½	101½	106
Metropolitan Edison	5s	1953	95½	91½	97
Metropolitan Pwr.	6s	1953	103	100	104
Michigan Lt.	5s	1946	98	97½	100
Michigan No. Pwr.	5s	1941	96	95½	97
Milwaukee Elec. Ry. & Lt.	5s	1926	100½	99½	101½
Milwaukee Elec. Ry. & Lt.	4½s	1931	97	94½	97
Milwaukee Elec. Ry. & Lt.	5s	1951	98½	94	100
Milwaukee Elec. Ry. & Lt.	5s	1961	89	84½	92½
Milwaukee Elec. Ry. & Lt.	6s	1953	100½	98½	104
Minn. Pwr. & Lt.	5s	1955	95	95	97
Minn. Pwr. & Lt.	6s	1950	103½	101½	105½
Miss. River Pwr.	5s	1951	98½	96½	100½
Miss. River Pwr.	7s	1935	103	102	104
Mo. Edison Elec.	5s	1927	b100	100	100½
Mobile Elec.	5s	1946	96	91	97½
Montana Pwr.	5s	1943	99½	97½	100½
Montgomery Lt. & Wtr. Pwr.	5s	1943	ƒ93	86½	93½
Montreal Lt., Ht. & Pwr.	4½s	1932	97	97	98½
Montreal Lt., Ht. & Pwr.	5s	1933	98½	98½	101
Montreal Pub. Serv.	5s	1942	94½	89	94½
Mountain States Pwr.	6s	1938	98½	96½	100½
Nashville Ry. & Lt.	5s	1953	97	94	98
Nashville Ry. & Lt.	5s	1958	89½	84	88½
Nassau Lt. & Pwr.	5s	1927	99½	98	101
Nassau & Suffolk Ltg.	5s	1945	89	82	91
National Pwr. & Lt.	7s	1972	102½	97	103½
National Pub. Serv.	6½s	1955	94	94	96½
Nebraska Pwr.	5s	1949	99	97	99½
Nebraska Pwr.	6s	2022	95½	89½	95½
Nevada-Calif. Elec.	6s	1946	99	96½	100½
Nevada-Calif. Elec.	6s	1950	99	96½	100½
New England Pwr.	5s	1951	101	100½	103
New Jersey Pwr. & Lt.	5s	1936	95½	92½	97½
New Orleans Pub. Serv.	4½s	1935	85½	83½	88½
New Orleans Pub. Serv.	5s	1952	90½	90	92
New Orleans Pub. Serv.	5s	1955	88½	88½	90½
New Orleans Pub. Serv.	6s	1949	92	86½	93½
N. Y. & Queens Elec. Lt. & Pwr.	5s	1930	100½	99½	100½
N. Y. & Westchester Ltg.	4s	2004	78	76	81
N. Y. & Westchester Ltg.	5s	1954	96	93	97
New York Edison	6½s	1941	115	112	115½
New York Edison	5s	1944	101	99½	102
N. Y. Gas & Elec. Lt., Ht. & Pwr.	5s	1948	103½	100½	104½
N. Y. Gas & Elec. Lt., Ht. & Pwr.	4s	1949	89	86	90½
N. Y. State Gas & Elec.	5½s	1962	100½	96	101½
Newport News & Hampton Ry. Gas & Elec.	5s	1944	89	84	93
Niagara Falls Pwr.	5s	1932	101½	100	103
Niagara Falls Pwr.	6s	1932	105½	103½	106½
Niagara Falls Pwr.	6s	1950	104½	105½	106½
Niagara, Lock. & Ont. Pwr.	5s	1954	98½	104½	110
Niagara, Lock. & Ont. Pwr.	5s	1955	98½	97½	100
Niagara, Lock. & Ont. Pwr.	6s	1958	ƒ109½	104½	110½
Norfolk Ry. & Lt.	5s	1949	94	93	95½
No. Amer. Edison	6s	1952	101½	96½	102½
No. Amer. Edison	6½s	1948	104	100½	106
No. Amer. Lt. & Pwr.	7s	1954	98½	97	100
North Caro. Pub. Serv.	5s	1934	89	89	93½
North Caro. Pub. Serv.	6s	1954	94	91½	96
North Caro Pub. Serv.	6½s	1944	98	96	100
North Shore Elec.	5s	1940	99	97½	100
No. Calif. Pwr.	5s	1948	99½	98½	100½
No. Ind. Gas & Elec.	5s	1929	99	97	100½
No. Ind. Gas & Elec.	6s	1952	100	99½	103½
Northern N. Y. Utilities	5½s	1949	99	96½	101½
No. Ohio Trac. & Lt.	4s	1933	85	82	87½
No. Ohio Trac. & Lt.	5s	1956	81	78	87
No. Ohio Trac. & Lt.	6s	1926	98½	98½	100
No. Ohio Trac. & Lt.	6s	1947	94	91	97
No. Ontario Lt. & Pwr.	6s	1931	98	95½	99½
No. States Pwr.	6½s	1933	118½	105½	121
No. States Pwr. (notes)	6½s	1933	103	99½	104½
No. States Pwr.	6s	1948	102	101	104½
No. States Pwr.	6s	1941	104	103	107½
No. States Pwr.	5s	1941	96½	93	99½
No. Tex. Elec.	5s	1940	78	80½	82½
Northwestern Elec.	6s	1935	101	101½	102½
Northwestern Pub. Serv.	6½s	1948	99	97½	100½
Ohio Pwr.	5s	1952	92	89½	96
Ohio Pwr.	6s	1953	102½	101	104½
Ohio Pwr.	6s	2024	94	88½	95½
Ohio Pwr.	7s	1951	106	106½	107½
Ohio Pub. Serv.	5s	1954	90½	87	93
Ohio Pub. Serv.	6s	1953	100½	98	101½
Ohio Pub. Serv.	7½s	1946	111	108	112½
Ohio Pub. Serv.	7s	1947	94½	107½	111½
Ohio River Edison	6s	1948	101½	98½	104
Okla. Gas & Elec.	5s	1950	91½	93½	96
Okla. Gas & Elec.	6s	1940	96	96	98½
Ontario Pwr. of Niagara Falls	5s	1943	99½	98	100½
Ontario Transmission	5s	1945	99½	97	99½
Ozark Pwr. & Wtr.	5s	1952	76	75	81
Pacific Coast Pwr.	5s	1940	98	97½	99½
Pacific Gas & Elec.	5s	1942	96½	93½	99
Pacific Gas & Elec.	5s	1955	ƒ93½	94	95½
Pacific Gas & Elec.	5½s	1952	100	97½	102½
Pacific Gas & Elec.	6s	1941	105½	103½	106½
Pacific Lt. & Pwr.	5s	1951	99	98½	100½
Pacific Lt. & Pwr.	5s	1942	99½	98	101½
Pacific Pwr. & Lt.	5s	1930	99½	98	100
Pacific Pwr. & Lt.	5s	1953	ƒ96½	...	...
Parr Shoals Pwr.	5s	1952	94	92½	97
Patterson & Passaic Gas & Elec.	5s	1949	100½	96	100½
Penn Central Lt. & Pwr	6s	1953	101½	102	104½
Penn Edison	5s	1946	96	94	97½
Penn Elec.	6½s	1954	97	96	99½
Penn. Elec.	6s	1955	93½	93½	95
Penn Ohio Elec.	6½s	1938	104½	99½	105
Penn Ohio Pwr. & Lt.	5½s	1954	97½	95	99½
Penn Ohio Pwr. & Lt.	6s	1939	97½	94	99
Penn Pwr. & Lt.	5s	1952	96½	95	98½
Penn Pwr. & Lt.	5s	1953	96½	95	98½
Penn Pwr. & Lt.	6s	1953	104½	102½	105½
Penn Pwr. & Lt.	7s	1951	106	106	107½
Penn Pub. Serv.	5s	1954	94½	93	96½
Penn Pub. Serv.	6s	1947	102½	103	105½
Penn Wtr. & Pwr.	5s	1940	100	99½	102
Penn Wtr. & Pwr.	5½s	1953	102	99½	103
Phila. Co.	6s	1944	103½	101½	105
Phila. Co.	5½s	1938	98½	93½	100
Phila. Co.	5s	1951	95	95	97
Phila. Elec.	5s	1966	c101½	100	104½
Phila. Elec.	5s	1960	c100½	100	104
Phila. Elec.	5½s	1947	c106	103½	107
Phila. Elec.	5½s	1953	c106½	104½	107½
Phila. Elec.	6s	1941	106½	104	108
Portland Elec. Pwr.	6s	1947	99	96½	100½
Portland Gen. Elec.	5s	1935	99½	98½	100½
Portland Ry., Lt. & Pwr.	5s	1942	88½	84½	92
Portland Ry., Lt. & Pwr.	6s	1947	98½	94	100½
Portland Ry., Lt. & Pwr.	7½s	1946	106	105½	108
Potomac Edison	6s	1949	98	96	100
Potomac Edison	6½s	1948	101	99	103½
Potomac Elec. Pwr.	5s	1929	100	99	100½
Potomac Elec. Pwr.	5s	1936	99	98½	100
Power Corp. of N. Y.	6s	1942	99	97½	100½
Power Corp. of N. Y.	6½s	1942	103½	99½	103½
Power Securities	6s	1949	‹80	...	...
Pub. Lt. & Pwr.	5s	1945	68	64	79
Pub. Serv. Co. of Colo.	5½s	1954	93½	92	96½
Pub. Serv. Co. of Colo.	6s	1953	99	98	101
Pub. Serv. Co. of Colo.	7s	1933	99	98½	102½
Pub. Serv. Corp. of N. J.	5s	1959	104½	103½	105½
Pub. Serv. Corp. of N. J.	6s	1944	99½	95	100
Pub. Serv. Co. of No. Ill.	5s	1956	96½	91	97½
Pub. Serv. Co. of No. Ill.	5½s	1962	100½	96½	102½
Pub. Serv. Co. of No. Ill.	5½s	1964	100½	96½	102½
Pub. Serv. Co. of Okla.	6s	1949	99	97½	103
Pub. Serv. Elec. & Gas.	5½s	1959	102½	98½	105½
Pub. Serv. Elec. & Gas.	5½s	1964	102½	99½	105
Public Utilities (Evansville, Ind.)	6s	1929	99½	99	101
Puget Sound Pwr.	5s	1933	98	98½	100½
Puget Sound Pwr. & Lt.	5½s	1949	98½	96½	100½
Quebec Pwr.	6s	1953	101½	98½	102½
Queensborough Gas & Elec.	5s	1952	99	96½	100½
Queensborough Gas & Elec.	6s	1953	103	101	105
Rio de Janeiro Tram., Lt. & Pwr.	5s	1935	91½	85	91½
Robbins & Myers	7s	1952	58	57½	73½
Rochester Gas & Elec.	5½s	1948	102	102	104½
Rochester Gas & Elec.	7s	1946	109½	109½	111
Rockford Elec.	5s	1939	99	98	101
St. Joseph Ry., Lt., Ht. & Pwr.	5s	1937	9'½	85½	92
St. Paul Gas Lt.	5s	1944	100	98½	100½
St. Paul Gas Lt.	5½s	1954	101	98	102½
Salt River Valley Wtr.	6s	1938	‹100	...	...
Salmon River Pwr.	5s	1952	102½	98½	101½
San Antonio Gas & Elec.	5s	1949	97	96	98½
San Antonio Pub. Serv.	6s	1952	102½	99½	104
San Diego Cons. Gas & Elec.	5s	1939	100	98	101
San Diego Cons. Gas & Elec.	6s	1939	101½	99	103
San Joaquin Lt. & Pwr.	5s	1945	98	98	100
San Joaquin Lt. & Pwr.	6s	1950	101½	101	103½
San Joaquin Lt. & Pwr.	6s	1952	101	99½	103½
San Joaquin Lt. & Pwr.	6s	1954	100	99	101
Savannah Elec. & Pwr.	7½s	1941	‹104½	...	...
Saxon Pub. Wks. (Germany)	7s	1945	92½	90½	93½
Scranton Electric	5s	1937	99½	99½	101½
Seattle Elec.	5s	1930	99	99½	101
Seattle Elec.	5s	1929	99	99	100½
Seattle Elec.	5s	1939	90	90	93½
Seattle Ltg.	5s	1949	89	85½	92
Shawinigan Wtr. & Pwr.	5s	1934	100	100	101½
Shawinigan Wtr. & Pwr.	5½s	1950	102	101½	104
Shawinigan Wtr. & Pwr.	6s	1950	104½	104	106½
Siemens & Halske	7s	1928	95½	92½	99½
Siemens & Halske	7s	1935	92½	90½	96½
Sierra & San Francisco Pwr.	5s	1949	75	75	80
Sierra & San Francisco Pwr.	6s	1949	89	87	93½
Sioux City Gas & Elec.	6s	1947	101	99	102
Sioux City Gas & Elec.	6s	1949	101	99	102
So. Caro. Gas & Elec.	6s	1942	87	87	93
So. Caro. Gas & Elec.	6s	1932	75	83	88
Southeast Pwr. & Lt.	6s	2025	97	96½	97½
So. Cal. Edison	5s	1939	99½	99½	101
So. Cal. Edison	5s	1944	95	92½	96½
So. Cal. Edison	5½s	1944	101	98½	102
So. Cal. Edison	6s	1943	101½	100½	104
So. Cal. Edison	6s	1944	103½	102½	105½
So. Cities Utilities	5s	1931	98	100	102
Southern Colo. Power	6s	1947	98	93½	99½
So. Public Utilities	5s	1943	97	97½	100½
So. Sierras Pwr.	6s	1936	102	102	104½
So. Utilities	6s	1933	100	97½	102½
So. Wisconsin Pwr.	5s	1938	89	88	93
Southwestern Gas & Elec.	5s	1932	96½	94	98
Southwestern Gas & Elec.	6s	1957	96	89	97½
Southwestern Pwr. & Lt.	5s	1943	94	90	97
Southwestern Pwr. & Lt.	6s	2022	92	88½	94½
Southwestern Utilities	8s	1936	97½	96	102
Springfield Ry. & Lt.	5s	1926	99	98½	100½
Standard Elec. of Cal.	5s	1939	98	98½	100½
Standard Gas & Elec.	6s	1935	99½	91	101
Staten Island Edison	6½s	1953	104	104	106½
Syracuse Ltg.	5s	1951	99½	97½	100½
Syracuse Ltg.	5½s	1954	101	100½	103
Tampa Elec.	5s	1933	‹99	...	...
Tenn. Elec. Pwr.	6s	1947	102½	99½	104½
Tenn. Pwr.	5s	1962	94	90	96½
Tex. Pwr. & Lt.	5s	1937	97½	97	99½
Tex. Pwr. & Lt.	6s	2022	96½	90	96½
Tide Water Pwr.	6s	1942	99½	98½	101
Tide Water Pwr.	7s	1937	98½	97½	101½
Toho Elec. Pwr. (Japan)	7s	1955	90	87	91½
Tokyo Elec. (Japan)	6s	1928	98½	98½	99½
Toledo Edison	5s	1947	98½	97	100
Toledo Edison	7s	1941	109½	108½	110
Toledo Gas Elec. & Htg.	5s	1935	96	97½	100½
Toledo Trac., Lt. & Pr. notes	5½s	1930	97½	97½	100½
Topeka Edison	5s	1930	98½	97	100
Topeka Ry. & Lt.	5s	1933	95½	90½	96½
Trenton Gas & Elec.	5s	1949	98	98	100
Tri-City Ry. & Lt.	5s	1930	98½	96½	99½
Twin State Gas & Elec.	5s	1953	93	84	94½
Tyrol Hydro-Elec. Pwr.	7½s	1955	96½	94½	96½
Union Elec. Lt. & Pwr.	5s	1932	101½	99½	102
Union Elec. Lt. & Pwr.	5s	1933	99½	98½	101
Union Elec. Lt. & Pwr.	5s	1954	98½	97½	100
Union Elec. Lt. & Pwr.	5½s	1954	100½	100	104
United Elec. of N. J.	4s	1949	87½	85	88½
United Elec. Lt. & Pwr.	4½s	1929	ƒ98½	98½	99
United Gas & Elec.	6s	1945	97	96	101
United Lt. & Pwr. notes	5½s	1928	98½	98	100
United Lt. & Pwr.	5½s	1959	94	89½	97
United Lt. & Pwr.	6½s	1974	95½	92½	97½
United Lt. & Rys.	5s	1932	96	93½	97½
United Lt. & Rys.	6s	1926	99	100½	101½
United Lt. & Rys.	6s	1952	98½	95½	100½
United Lt. & Rys.	6s	1973	89	87	92
United Pwr. & Lt.	6s	1944	101	99	103
Utah Lt. & Trac.	5s	1944	87½	83½	91½
Utah Pwr. & Lt.	5s	1944	94½	91	98½
Utah Pwr. & Lt.	6s	1944	102	102	104½
Utah Pwr. & Lt.	6s	2022	92	88½	94½
Utica Elec. Lt. & Pwr.	5s	1950	101½	100½	102
Utica Gas & Elec.	5s	1957	100½	98½	103
Vermont Hydro-Elec.	6s	1929	99	98½	100½
Vicksburg Lt. & Trac.	5s	1932	90	89	93½
Virginian Pwr.	5s	1942	93½	88	96
Virginian Pwr.	6½s	1954	101	99	102½
Virginia Ry. & Pwr.	5s	1943	97½	93½	99
Wagner Elec. Mfg.	7s	...	ƒ100½	100	102
Washington Coast Util.	6s	1941	101	99½	101½
Washington Wtr. Pwr.	5s	1939	100½	99½	101½
West Penn Pwr.	5s	1963	98½	93½	99½
West Penn Pwr.	5s	1946	98½	93½	100
West Penn Pwr.	5½s	1953	103	100½	105½
West Penn Pwr.	7s	1946	107	104½	107½
West Virginia Lt., Ht. & Pwr.	6s	1929	100	95	100
West Virginia Utilities	6s	1935	96½	91	98
Westchester Ltg.	5s	1950	101½	98	102½
Western Elec.	5s	1944	100½	98	101½
Western N. Y. Utilities	5s	1946	94	90½	97
Western Pwr.	6½s	1954	99½	97	100½
West. States Gas & Elec.	5s	1941	97	95	99½
West. States Gas & Elec.	6s	1947	98	97	100½
Westinghouse Elec. & Mfg.	7s	1931	106½	103½	108½
Wisconsin Elec. Pwr.	5s	1954	98½	93½	99½
Wisconsin Gas & Elec.	5s	1952	98	97	100½
Wis.-Minn. Lt. & Pwr.	5s	1944	96	93	96½
Wis. Ry., Lt. & Pwr.	5s	1933	92½	87½	93½
Wis. River Pwr.	5s	1941	88	88	92½
Yadkin River Pwr.	5s	1941	98	96½	99½
Yarmouth Lt. & Pwr.	5s	1937	83	82	87
Yarmouth Lt. & Pwr.	8s	1951	98	97	102

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco. ‹Bid price, low, high, Oct. 13. ƒLatest quotations available.

Business Facts for Electrical Men

Selected Statistics Presented Graphically for the Use of All Interested in Analyzing the Trend of the Electrical Business

The Progressive West

THROUGHOUT history men of spirit and adventure have looked to the West for the fullfilment of their desires. Always has it held out to the rest of the world a vision of hope and wealth and contentment. This has been especially true in America, and even today, stripped largely of its glories of adventure, the West still holds a certain enchantment for the people of the East. The Western States of this country have always radiated optimism to its *n*th degree, and "progress" has been their slogan.

This great section of the country, comprising the Mountain and Pacific States, has not been slow, therefore, to realize the economic advantages of electrical energy in the home, on the farm, in the factory and in the solution of its transportation problems. The hugeness of some of its hydro-electric developments has stirred the wonder of the nation, and the higher degree of electrical saturation in the homes of the section has opened the eyes of the East to increase the domestic load within its reach also.

The operations of the central-station industry in the Western States have increased year by year. In fact, the accompanying diagram indicates that the present year will witness the largest annual growth ever reported by the industry in that part of the country. Since the opening of the year the central stations have been operating several per cent above the estimated normal based upon the activities for the past five years, and there is every reason to believe that abnormal activity will continue during the remainder of the year.

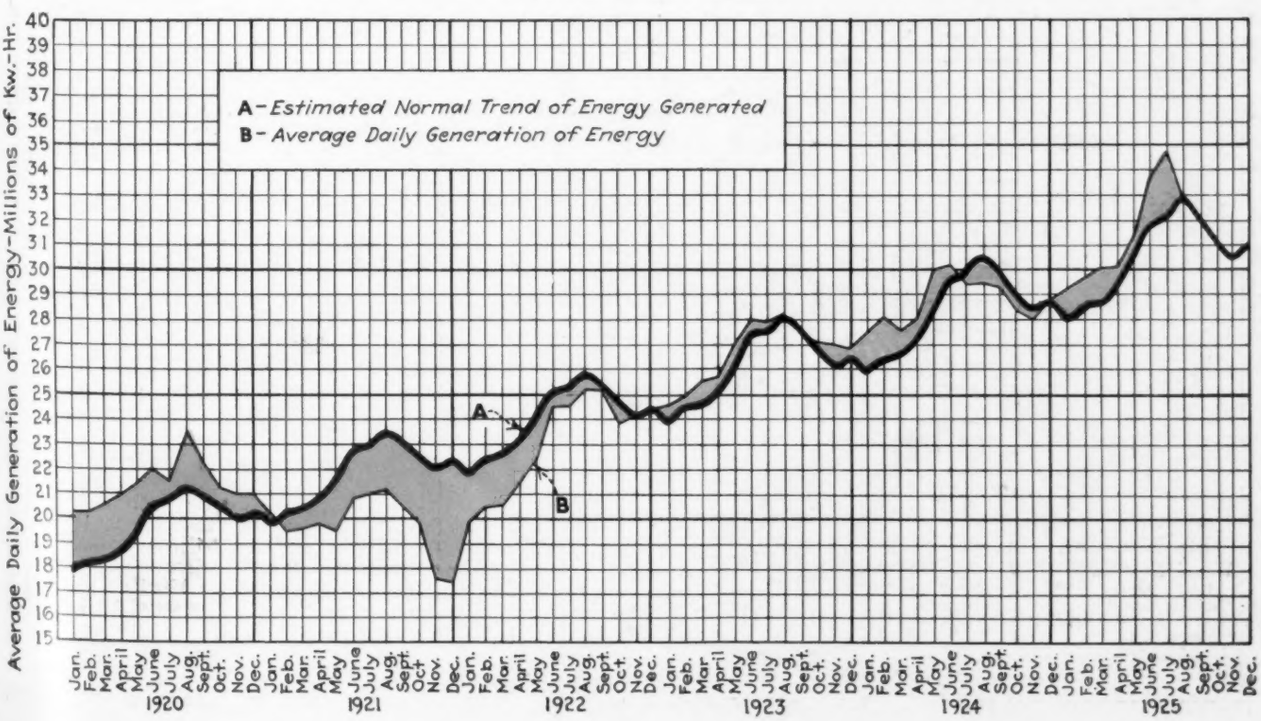
Some idea of the progress made by the central-station industry in the West since the war is to be drawn from the fact that the energy generated has increased from 7,988,892,000 kw.-hr. in 1920 to an estimated 11,767,000,000 kw.-hr. in 1925, value of plant and equipment has increased from $731,224,000 to $1,252,000,000, gross revenue from $118,690,000 to $185,200,000, number of employees from 15,280 to 22,080, customers served from 1,512,000 to 2,600,000, rating of installed generators from 2,520,000 kva. to 4,450,000 kva., water-power development from 2,500,000 hp. to 3,273,478 hp., and that during this six-year period the industry has spent a total of $550,000,000 for additions and extensions to its generation, transmission and distribution systems.

The central-station industry operating in the Mountain and Pacific States may well be proud of its past and glory in its future.

Most of the data for statistics in the ELECTRICAL WORLD are gathered by it from original sources. Privilege is freely given to readers of the ELECTRICAL WORLD to quote for use these statistics for any legitimate purpose. While there is no requirement that the source of data be given, yet it would help the ELECTRICAL WORLD in obtaining and compiling further basic information if those who make use of these statistics would give credit to the ELECTRICAL WORLD.

Energy Generated by Central Stations of the Mountain and Pacific States

(100 per Cent of the Industry)



A Sane Development of the Nation's Water Resources

ONE of the outstanding developments of modern civilization at its best is the increased interest of the individual in the problems of the other man. Not only are men trying to make this world a better place to live in, but they are coming day by day to understand better the problems of their fellow-men and to direct their own activities in line with those of others. This tendency toward a broader understanding of human affairs applies not only to the domestic problems but to industrial and general economic problems as well.

This tendency is well illustrated in the history of the development of the nation's water resources. The streams of the country are primarily available for use in three ways—to transport the inland shipping of the country, to irrigate both the agricultural lands which border the streams and, as has been done in the arid West, lands many miles from the bed of the streams, and to furnish power for waterwheels and turbines. The problem of those interested in the development of the nation's water resources lies in the proper and most efficient distribution of their use, the basic factor in all such development being the greatest benefit accruing to the American people.

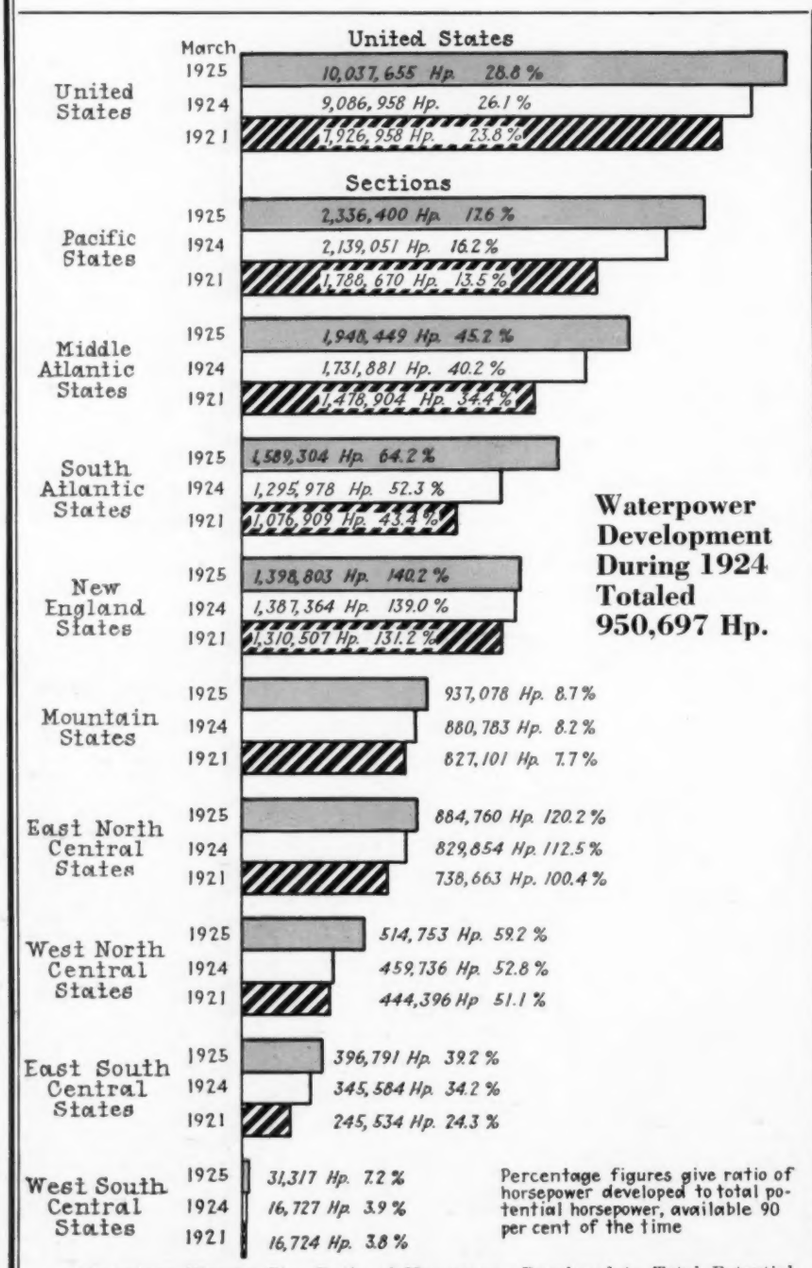
There are many thousands of miles of rivers in the United States that are used or usable in some degree for transportation, but by far the greater part of these have too flat a slope to be suitable for power development. It is estimated, however, that there are about 4,300 miles adaptable to power development and to a form of navigation appropriate to such development. It is further estimated that in these 4,300 miles there are no less than ten million potential water horsepower.

The Federal Power Commission very aptly points out the salient facts in the case. "In addition to the great desirability of co-ordinating navigation and power development on all streams where both uses can be had," it says, "is the necessity of securing the greatest practical utilization of the water power of all our streams. We have no surplus of water-power resources. Our best estimates indicate that we have a total of 55,000,000 hp. of developed and undeveloped water power available for 50 per cent of the time. The combined installation in central electric stations, electric railways and industry in the United States in 1924 is estimated at 56,000,000 hp., with several millions more employed in railroad transportation.

"Our power demands at the present time, therefore, exceed our total water-power resources, and we should not permit waste in their development. Furthermore, 72 per cent of our water-power resources are west of the Mississippi, while 79 per cent of our power resources are east of that river. In the eleven Northeastern States where our greatest industrial concentration is found our total water-power resources are less than one-third of the present power demands, exclusive of the railroads.

"It is universally recognized that the future of American industry and transportation is dependent upon the use of electric energy and that in the production of such industry water power should be used to the full extent of its economic feasibility. If, therefore, we are to develop these powers to the fullest productivity, free from all avoidable waste, and are to secure at the same time the correlated use of the waters for navigation, irrigation and other beneficial purposes, we must change from the haphazard method heretofore employed and proceed to prepare real plans of comprehensive stream development."

Data collected by the United States Geological Survey indicate that in March of this year waterpower developments totaled 10,037,655 hp., indicating an increase of 950,697 hp. during 1924. These figures indicate a present development of 28.8 per cent of the potential water powers of the nation available 90 per cent of the time. The greatest development is recorded by the Pacific States with 2,336,400 hp., but this figure is only 17.6 per cent of the power available 90 per cent of the time. On the other hand, the Middle Atlantic States report a development of 1,948,449 hp., which is 45.2 per cent of the potential power available 90 per cent of the time.



Percentage Figures Give Ratio of Horsepower Developed to Total Potential Horsepower Available 90 per Cent of the Time